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Tacoma

THEA FOSS AND WHEELER-OSGOOD WATERWAYS REMEDIATION PROJECT

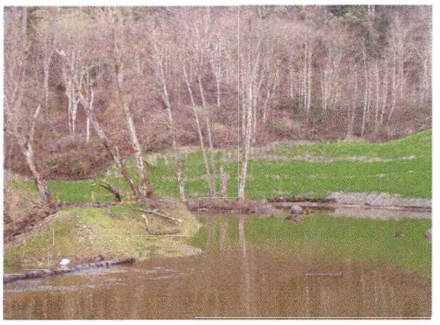
YEAR 12 MONITORING

HABITAT MITIGATION AREA AND SLOPE REHABILITATION AREA PRELIMINARY FINDINGS MEMORANDUM

AUGUST 23, 2018







Prepared for:

U.S. ENVIRONMENTAL PROTECTION AGENCY

Prepared by:

CITY OF TACOMA

PRELIMINARY FINDINGS MEMORANDUM
HABITAT MITIGATION AREA AND
SLOPE REHABILITATION AREA
YEAR 12 MONITORING

1.0 Introduction

This memorandum presents the findings from the Year 12 habitat mitigation area monitoring performed at the Thea Foss Waterway habitat mitigation and enhancement area sites. In addition, this memorandum presents the findings from the Year 12 Slope Rehabilitation Area monitoring. Habitat mitigation area monitoring and slope rehabilitation area monitoring were performed in accordance with the Long Term Monitoring Plan (LTMP) for the Thea Foss and Wheeler-Osgood Waterways Remediation Project (City of Tacoma 2018a).

The following sections summarize the monitoring requirements for both the habitat areas and the slope rehabilitation areas, along with the findings of these inspections. As described in the LTMP, the habitat mitigation areas (North Beach Habitat, Middle Waterway Tideflat Habitat, Puyallup River Side Channel, and the Hylebos Creek Mitigation Site) the Thea Foss Habitat Enhancement Areas (Johnny's Dock Habitat Enhancement, Head of Thea Foss Shoreline Habitat, SR 509 Esplanade Riparian Habitat, and the Log Step Habitat Enhancement), and the slope rehabilitation areas were inspected during this monitoring event. Monitoring activities were performed at each location in accordance with the LTMP. Provided with this memorandum are attachments that contain copies of the field forms and photographs documenting observations and site conditions identified during the inspections. A complete analysis of the Year 12 monitoring activities will be presented in the Year 12 Monitoring Event Report.

2.0 Summary of LTMP Habitat Mitigation Area and Slope Rehabilitation Area Inspection Requirements

2.1 HABITAT AREA MONITORING

The purpose of the habitat mitigation/restoration area long-term monitoring program is to evaluate and ensure the ongoing success in development and maintenance of the habitat mitigation/restoration areas constructed as part of the Thea Foss and Wheeler-Osgood Waterways Remediation Project. Habitat mitigation sites were constructed within the Middle Waterway Tideflat, adjacent to the St. Paul/Middle Waterway peninsula, on the Puyallup River, and along Hylebos Creek (see Figures 1 through 4). These mitigation sites had performance criteria for establishment during the first 10 years of monitoring as identified in the Operations, Maintenance, and Monitoring Plan (OMMP). In addition, four habitat enhancement sites were constructed within the Thea

Foss Waterway: the Head of Thea Foss Shoreline Habitat, Johnny's Dock Habitat Enhancement, SR 509 Esplanade Riparian Habitat, and Log Step Habitat Enhancement (see Figures 5 through 8). These four sites were qualitatively monitored during the OMMP but there were no quantitative performance monitoring criteria.

LTMP field activities for these areas will consist of a combination of qualitative ground surveys and representative photographic documentation. Standardized field forms are used to document observations of conditions at the sites. Observations documented during the habitat area inspections include the following, where applicable:

- Evidence of erosion/sedimentation;
- Presence of wildlife;
- Condition of vegetation/presence of invasive species;
- Presence of debris on the shoreline surface; and
- Indicators of animal damage, vegetative disease, and human impacts.

As required by the LTMP, representative photographs taken during habitat monitoring activities are generally taken when tidal elevations are below 0.0 feet Mean Lower Low Water (MLLW) except at the Hylebos Creek Mitigation Site where the primary monitoring activities are performed when tidal elevations are below 8.78 feet MLLW.

A complete evaluation of the results of the Year 12 monitoring activities will be contained in the Year 12 Monitoring Event Report.

2.2 SUMMARY OF LTMP SLOPE REHABILITATION MONITORING REQUIREMENTS

In the slope rehabilitation areas, visual shoreline inspections are conducted as part of the LTMP to ensure that these intertidal areas continue to provide suitable intertidal habitat. These visual inspections are performed in the slope rehabilitation areas present in RAs 10, 11, 13, and 15 during periods of low tide (when predicted tidal elevations are 0.0 feet MLLW or lower). The locations of slope rehabilitation areas are shown on Figure 9. Observations documented during the slope rehabilitation visual inspections include the following, where applicable:

- Surface characteristics (i.e., silt, sand, riprap, quarry spalls, habitat mix, etc.);
- Evidence of groundwater seepage;
- Any apparent loss or down-slope movement of material (erosion);
- Presence of debris on the shoreline surface; and
- Indicators of potential contamination (i.e., sheen or staining) on the shoreline surface.

Representative photograph are also collected during these shoreline inspections to record the conditions of these intertidal areas over time.

Year 12 is the first time visual inspections are performed within the slope rehabilitation areas.

3.0 Summary of Year 12 Habitat Mitigation Area and Slope Rehabilitation Area Inspection Field Activities

3.1 HABITAT MITIGATION AREAS

Year 12 habitat monitoring activities at both the mitigation and enhancement sites, including qualitative ground surveys and representative photo documentation were completed between July 25 and July 27, 2018. A site-by-site discussion of inspection observations follows in Section 4.

Attachment A of this PFM contains copies of the field notes and photographs documenting observations made during the Year 12 habitat area inspections.

3.2 SUMMARY OF YEAR 12 SLOPE REHABILITATION INSPECTION FIELD ACTIVITIES

Year 12 slope rehabilitation inspections were performed in RA 15 on June 27, 2018 and in RAs 10, 11, and 13 on June 28, 2018. These inspections were performed when actual tidal elevations were at or below 0.0 feet MLLW. Photographs were taken approximately every 50 feet within each of the slope rehabilitation areas to document the slope conditions. Photographs were also taken to document notable observations, where applicable.

Global Positioning System (GPS) units were used to document the inspection start and end points, the locations of notable observations, and photograph points. The coordinates from these locations were recorded in field notes or on photo documentation field forms. Prior to initiation of each day's inspection activities, quality control checks were performed on the GPS units by comparing the recorded GPS coordinates with the known coordinates at a benchmark location. The GPS readings were within 10 feet of the recorded benchmark coordinates.

Attachment B of this PFM contains copies of the field notes and photographs documenting observations made during the Year 12 slope rehabilitation inspections.

4.0 Year 12 Habitat Mitigation Area and Slope Rehabilitation Area Inspection Observations

4.1 HABITAT MITIGATION AREAS

4.1.1 North Beach Habitat

The St. Paul Beach Habitat, Peninsula Habitat, and Middle Waterway Corridor Habitat areas as defined during the construction process are collectively referred to as the

North Beach Habitat (see Figure 1). These habitat areas are buffered from upland activities by a 10- to 20-foot wide riparian buffer.

The completed St. Paul Beach portion of the habitat area is composed of low gradient, fine grained beach habitat. The beach slopes at a low angle (10H:1V or flatter) to approximately 8 feet MLLW and is composed of habitat mix. The beach then slopes more steeply upward (approximately 3H:1V), meeting the St. Paul Confined Disposal Facility (CDF) berm at an elevation of approximately 13.5 feet MLLW. The beach surface in this area is comprised of habitat mix and rounded cobbles similar to the nearby Olympic View Resource Area beach.

The top of the containment berm was planted with native plants to form a riparian buffer. An additional planting area was constructed in 2009 as authorized by EPA to resolve additional habitat acreage owed by the City as a result of the remediation construction project. The area is approximately 15 feet wide and was constructed landward of the edge of the existing riparian zone at the site. Approximately one foot of topsoil was placed across the area prior to planting with riparian vegetation.

The peninsula portion of the habitat area is composed of restored littoral habitat including a continuation of the shallow water habitat contours of the St. Paul Beach. Over 1,900 creosote treated piles were removed from this area so that the existing contours could be covered with sand ranging in depth from six inches to several feet. This portion of the habitat area includes the development of an undulating band of marsh habitat at an elevation of 10 feet MLLW to 12 feet MLLW, above the steeper transition between 8 feet MLLW and 10 feet MLLW. The upper beach slopes to a relatively low pass across the central area of the peninsula. This pass allows juvenile salmonids moving across the face of the St. Paul Beach at tides above MLLW to continue their migration in relatively protected shallow water into the entrance of the Middle Waterway. North of the pass, the habitat area rises to an offshore shoal or reef at 12 feet MLLW. This shoal partially shelters areas to the south and east from waves from the northwest.

Existing uplands at the tip of the Middle/St. Paul Peninsula were cut back and excavated to provide new marine habitat area at the southwest corner of the site. Eight nodes of marsh species appropriate for lower and upper saltmarsh elevations were planted in this habitat area. Three of these nodes were designated as pilot nodes due to their exposure and the likelihood that plantings would be difficult to establish. LWD was placed in the southwest corner to increase habitat complexity and to provide protective cover for juvenile salmonids. As a result of some erosion that was identified at the face of the containment berm after the baseline monitoring event, additional LWD was placed at the northwest corner of the site in August 2007.

The Middle Waterway Corridor portion of the habitat area consists of a narrow shoreline that connects the peninsula portion of the site with the broad mudflats and salt marsh in the southern portion of Middle Waterway. Approximately 250 feet of stacked concrete bulkhead along the east shore of the Middle Waterway were removed and the slope

protected with a thick slope cap and habitat mix. This design provides shallow-water, fish-passable shoreline access to and from the inner Middle Waterway habitat areas during most tidal conditions.

Qualitative Ground Survey – The qualitative ground survey at this site was conducted on July 26, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in fair condition. Construction is currently underway at the adjacent CDF and the riparian area is quite dry due to the extreme summer heat. Upon arrival, there were Canada geese, crabs, gulls, Caspian terns, a great blue heron, cormorant, starlings, and a seal present at the site.

Natural gravel movement and regrading was noted at the site with a significant gravel push near the back marsh area of the Middle Waterway Corridor portion, and the ridge leading to the shoal appearing somewhat less steep and lower in elevation than has been observed in previous inspections. There has been some continuation of the erosion at the toe of the slope of the containment berm where it meets the habitat beach, and it appears to be closer to achieving a more gentle and natural angle of repose. This erosion is discussed further below and is being tracked as part of CDF monitoring and will be discussed further in the St. Paul Waterway Confined Disposal Facility Year 12 Performance Monitoring Memorandum (CDF PFM). Several seeps were noted near West Rock at the eastern end of the beach in front of the CDF.

There was some indication of grazing of the dune grass by geese noted, but no indication of vandalism found at the site. Some cut vegetation was observed in the riparian area; however this is believed to be associated with recent construction and survey activity on site. Small plastic fluff debris was observed on the upper beach on the east end of the containment berm near West Rock. In addition, two large concrete float sections, likely from the log haul out floating walkways, were present on the beach near the marsh area. Some wrack and organic material was noted in the same location as well as in the back marsh on the west side of the site. There was no indication of vegetative disease observed during this inspection. Some additional small LWD had settled in the back marsh area, and installed LWD is present and secured. One large recruited log previously in place along the CDF front was missing, which has impacted the quantity and overall vigor of the dune grass which was well established behind the log on the upper beach.

As described in the Baseline Annual Report (March 2007), after completion of the baseline qualitative survey in July 2006, some erosion along the toe of slope at the containment berm was identified. Several meetings and discussions with the agencies occurred, and as a result, the City placed additional LWD at agreed upon locations in August 2007. In addition, quarterly photographs and observations of the area were conducted through 2008 in conjunction with the quarterly baseline CDF monitoring. Based upon these quarterly inspections, the erosion appeared to have stabilized, and per agency concurrence, the area is currently being monitored as part of the regularly scheduled monitoring of the CDF.

A combination of pickleweed and saltgrass were originally planted in the eight marsh planting nodes. As indicated above, of these, three were considered pilot nodes due to their exposure and were not successful in becoming established because of site conditions. Two additional pilot nodes were later installed in the back marsh area to accelerate colonization. There continues to be minimal success of the saltgrass at this site, but the pickleweed remains well established and is continuing to spread well within the back marsh area. The area of coverage remains dynamic based on site conditions and annual differences in weather and storm events that regrade the beach gravels. Fleshy jaumea was observed volunteering in this area and is plentiful at this time. In addition, dunegrass is continuing to spread on the upper beach below the riparian slope in many areas although as indicated above, though some grazing by geese along with dry conditions has impacted its health this season.

The original riparian area was hydroseeded and is planted with a combination of American dunegrass, Hooker's willow, and oceanspray. Over time, there has been a higher survival rate observed for the riparian plantings in the area above the back marsh, and a lower survival rate along the CDF containment berm where the upper slope continues to erode as discussed above, and the underlying rocky substrate may drain more readily. Dunegrass is establishing and continuing to spread at the base of the containment berm where chunks of soil with established roots dropped on the upper intertidal area several years ago. However, this appears to be somewhat of an off year for the dunegrass with the grazing and missing log noted above, as well as the dry conditions. Over time, establishment of dunegrass along the upper shoreline in front of the containment berm will help with stabilization of the toe of the slope.

The newer riparian area was planted with a combination of Douglas fir, big-leaf maple, Pacific madrone, oceanspray, red-flowering currant, evergreen huckleberry, beaked hazelnut, black hawthorn, and snowberry. The trees were planted close to the waterward edge of the new planting area to prevent the root structure from impacting the containment aspect of the berm. Additional plants have been placed over time as part of routine maintenance to supplement areas where plants were lost. The area was showing some drought stress, as it has during past summer inspections. As part of the construction work underway at the CDF, the planting area will be expanded in the near future as part of their development mitigation. The City will work with the developer to coordinate maintenance of the combined area as the site develops.

A minimal amount of Himalayan blackberry was the only invasive species noted in the overall riparian area during this inspection. Minor weeding of the riparian area is therefore needed.

Photo Documentation – In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 10 photographs were taken at this site at tidal elevations ranging from approximately -0.99 feet MLLW to -1.09 feet MLLW. Copies of the photographs can be found in Attachment A.

4.1.2 Middle Waterway Tideflat Habitat

The Middle Waterway Tideflat Habitat with its associated mudflats and tidal channel was constructed on excavated uplands and existing tideflat along approximately 1,450 linear feet of the 1,800-foot long eastern shoreline of the Middle Waterway (see Figure 2). This habitat area begins immediately south of the relocated log haul out and immediately to the north of the existing Trustees/Simpson restoration project site along the southeast side of the waterway, and across Middle Waterway from the City's NRDA settlement restoration project and the Middle Waterway Action Committee shoreline restoration project.

The habitat area was excavated from elevations of 18 feet MLLW down to approximately 0 feet MLLW. A meandering tidal channel was excavated down to -4 feet MLLW at the north end, rising to -2 feet MLLW at the south end. The upper shoreline between 13 feet MLLW and 8 feet MLLW is enhanced with at least six inches of topsoil to support riparian plantings.

The marsh site is buffered from adjacent industrial activities with a 10- to 25-foot wide riparian area planted with native tree and shrub species and hydroseed. A freshwater sprinkler irrigation system was originally installed to irrigate the riparian area as well as approximately 40,000 sq. ft. of the site between elevation 11.5 feet MLLW and 12.5 feet MLLW for the purpose of establishing brackish marsh habitat. Due to difficulties in maintaining the irrigation system in functional order as well as the goal of establishing a more self-sustaining marsh at the site, the sprinkler system has been removed as authorized by EPA. The intertidal marsh is now well established with more salt tolerant plants along the upper shoreline area throughout the site.

Qualitative Ground Survey – The qualitative ground survey at this site was conducted on July 25, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in excellent condition. Upon arrival, there were some Canada geese, gulls, great blue heron, Caspian terns, starlings, sand bees, and clams present at the site. Some minor erosion was observed at the site associated with seeps, as well as more the substantial erosion which is continuing near the north end of the site and near the light pole and fence by the log haul out. As anticipated, the eroded area mid-site near the 2013 break in the irrigation line is filling in naturally so that the elevation change is less severe than was present right after the break.

There was only minor indication of animal damage in the marsh with geese eating the goose tongue, but none noted in the riparian area. Only small amounts of trash were present in the tide line; however more significant trash and human impacts were observed due to the presence of an encampment area at the site. The encampment is present in an area near the gate in the fence about mid-site. No vandalism was observed. There was no indication of plant disease although there remain some dead alder and conifer trees in the riparian area which have been present for several years.

LWD pieces are generally in good condition and additional logs including escapee log boom logs that have accumulated at the site. Very small amounts of bark were present at the site, likely because the log haul out facility located north of the habitat area is no longer in operation. It is estimated that the bark covered less than 1% of the portion of the site between elevation 10 feet MLLW and 13 feet MLLW. Thus, the presence of bark does not appear to have affected plant development as the amounts accumulated are so minimal. An algal mat was present in some locations at the site.

The site was originally planted in accordance with the approved planting plans. A combination of Lyngby's sedge and seacoast bulrush were planted in 12 original planting nodes in the upper intertidal zone between elevation 11.5 feet MLLW and 12.5 feet MLLW. The planting area was expanded in 2009 by constructing additional nodes between the existing, and planting with the same species to accelerate colonization. In addition, 10 nodes were constructed between 12.5 feet MLLW and the toe of the riparian slope. These areas were planted with a combination of tufted hairgrass, saltgrass, gumweed, and coastal strawberry. A combination of trees and shrubs, including black cottonwood, red alder, shore pine, Douglas fir, big-leaf maple, Hooker's willow, oceanspray, Sitka willow, and red-flowering currant were planted in the riparian area.

With the discontinuation of irrigation, the marsh plants have mostly transitioned at this point to more salt tolerant plants which would more typically be present in an intertidal location like this. Plants present in the marsh area now consist primarily of salt grass, pickleweed, fleshy jaumea, gumweed, orache and goose tongue. It was noted during the inspection that most of the plants are doing well, with continued growth and spreading of both established plants and volunteers. In most areas the vegetation is quite dense and appears healthy.

Because of the general success of plants both in the marsh and in the riparian area, minimal weeds are present at the site, and only minor weeding is needed. Himalayan blackberry was the only invasive species noted. It remains somewhat difficult to establish plants in the riparian area at the northern end of the site due to erosion, exposure and soil conditions.

Photo Documentation –In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 8 photographs were taken at this site at tidal elevations ranging from approximately -0.38 feet MLLW to -0.72 feet MLLW. Copies of the photographs can be found in Attachment A.

4.1.3 Puyallup River Side Channel

The Puyallup River Side Channel (PRSC) provides off-channel habitat intended for use by juvenile salmonids for rearing and refuge during their outmigration to the estuary (see Figure 3). The project merged an existing isolated wetland and an adjacent parcel that was excavated to as deep as -2 feet MLLW from existing uplands, into a single

off-channel habitat area. The existing flood control levee structure was breached following construction of a new levee to allow the river and the associated tidal hydrology to enter. The excavated channel and reconfigured existing wetland contain water during most tides.

A substantial area was left between about 6 feet MLLW and 13 feet MLLW to allow development of brackish marsh and riparian assemblages. The area on the inside of the existing Puyallup River dike has been planted with riparian vegetation. The mudflat areas below Ordinary High Water (OHW) have been left for natural colonization by native brackish marsh species (as occurred at the Gog-Le-Hi-Te site across the river).

Additional plantings were completed as authorized by EPA to resolve additional habitat acreage owed by the City as a result of the remediation construction project. These additional plantings were placed in the riparian areas on both the old and new levee structures. On the old levee, the existing planting area was enhanced with additional trees and shrubs, and the three foot walking path was eliminated by planting. The waterward slope of the new levee was planted over an approximately 10 foot width above approximate elevation 13 feet MLLW. All parties acknowledge that the area will be mowed by the Army Corps of Engineers on a routine basis for levee maintenance, however the benefit provided to the habitat area between maintenance events made this area a priority for planting.

Qualitative Ground Survey – The qualitative ground survey at this site was conducted on July 25, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in excellent condition and vegetation in the riparian area on the old levee is generally dense. At the time of the survey, the stream flow in the Puyallup River was 2,110 cfs with a corresponding gauge height of 11.39 feet at the USGS River monitoring station 12101500, identified as Puyallup River at Puyallup, WA. Upon arrival, there were crows, cormorant, bees, killdeer and gulls present at the site in addition to evidence of recent beaver activity. Minimal erosion was observed associated with tidal drainage. In addition, regrading/redistribution of sediment was noted resulting in somewhat of a decreased slope angle on the river side of the side channel area.

Fencing and gates have been installed in the East 18th St. right-of-way since completion of the last inspection. The presence of this fencing has had a positive effect, significantly decreasing the transient population that was previously present at this site. Some trash and other evidence of transient use were present, and will be removed. Some other trash was present as well including styrofoam and a propane tank which will also be removed. There was no evidence of vandalism noted at the site.

Minor animal damage was noted including willow borer, leaf worm and caterpillar. Some organic material and woody debris was present, particularly in the upstream end of the channel in the sediment push area as well as at the mouth.

The site was originally planted in accordance with the approved planting plans. A combination of trees and shrubs, including black cottonwood, red alder, shore pine,

Douglas fir, big-leaf maple, Hooker's willow, oceanspray, red-flowering currant, and Sitka willow were planted on the top of the old, cutdown levee. As indicated above, additional plantings in the riparian area on both the old and new levees were placed in 2009. The old levee was enhanced with black cottonwood, red alder, shore pine, Douglas fir, big-leaf maple, Hooker's willow, oceanspray, red-flowering currant, red-osier dogwood, and Sitka willow. Species planted on the waterward face of the new levee include Sitka and Hooker's willow, red alder, red-osier dogwood, snowberry, and Nootka rose. With the reduction in encampments present on the site, the riparian plants in some areas on the old levee are recovering well, and both original and newer plants are growing and spreading nicely. Some additional planting on the former trail in this area will be done in the continuing effort to minimize the use of this site while increasing the vegetation density. The waterward face of the new levee had been mowed by the ACOE down to the high tide line fairly recently. Invasive species noted during the inspection include Himalayan blackberry, butterfly bush, dune tansy, and white sweet clover.

Photo Documentation – In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 10 photographs were taken at this site at tidal elevations ranging from approximately -0.15 feet MLLW to -0.69 feet MLLW. Copies of the photographs can be found in Attachment A.

4.1.4 Hylebos Creek Mitigation Site

Hylebos Creek is the major tributary to the Hylebos Waterway. The project area is located on the right bank of lower Hylebos Creek. Hylebos Creek has a large watershed, the majority of which extends north into King County. The project site is bordered by the 4th Street Bridge at its southern end and the on-site 400 feet of stream reach lies completely within the saltwater wedge associated with Commencement Bay's tidal prism. The total project area includes a riparian/forested wetland enhancement and created off-channel aquatic habitat (see Figure 4).

On-site native vegetation includes Oregon ash, red osier dogwood, salmonberry, and black cottonwood. This project complements the neighboring restored areas, including the Milgard mitigation project and the NRDA Trustees' Jordan project. Both projects are located to the south of the Hylebos Creek Mitigation Site. The Jordan project is designed to provide off-channel salmon habitat to the east of the creek's bank, while the Milgard project restored the creek's western riparian buffer. The City's Hylebos Creek Mitigation Site adds to the area's habitat value and extends the wildlife corridor already established.

Habitat in this area was enhanced within a linear band paralleling Hylebos Creek. Enhancements included removal of non-native invasive Himalayan blackberry, reed canary grass, and yellow-flag iris. These species were replaced with native plants appropriate to the new hydrological regime, including Sitka willow, Sitka spruce, Nootka rose, mock orange, Hooker's willow, and oceanspray. While much of the reed canary

grass and yellow-flag iris were removed during construction, they still exist at the site due to a large parent source upstream.

Where possible with the least disturbance to native vegetation, small channel "fingers" were excavated into the existing bank to allow water inundation during periods of high freshwater flows or tidal surges. The off-channel area provides habitat for the creek's out-migrating juvenile salmonids that need refuge areas while acclimatizing to saltwater. The added aquatic habitat, water retention and wetland enhancement provide a more diverse habitat and increased wildlife protection by screening it from the adjacent open areas. Preservation of the existing mature native bankside vegetation allows for the continued contribution of leaf litter, shade, and nutrients to the creek.

Qualitative Ground Survey – The qualitative ground survey at this site was conducted on July 26, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in excellent condition. At the time of the qualitative inspection including representative photographs, the stream flow in the Puyallup River was 2,030 cfs with a corresponding gauge height of 11.31 feet at the USGS River monitoring station 12101500, identified as Puyallup River at Puyallup, WA.

Upon arrival, there were small avian species present, along with some evidence of past beaver activity. No significant erosion and or sedimentation were identified at the site. No animal damage was observed with the exception of the past beaver impacts. Only minor trash was observed and there was no evidence of vandalism observed at the site, but social trails remain to some extent. There were no wrack or organic material accumulations noted. LWD is present and appeared in good condition with no maintenance actions identified.

The site was planted in accordance with the approved planting plans. The upland forest was planted with a variety of trees and shrubs, including Douglas fir, Sitka spruce, big-leaf maple, shore pine, thimbleberry, oceanspray, snowberry, mock orange, kinnickkinick, western service berry, baldhip rose and bracken fern. Erosion control hydroseed mix was also applied at the site. This portion of the site is in excellent condition, and the vegetation is quite dense. No maintenance activities were identified.

The forested wetland portion of the site was also planted with a combination of trees and shrubs, including red alder, Oregon ash, western red cedar, black cottonwood, western crabapple, beaked hazelnut, Pacific ninebark, black twinberry, vine maple, red-osier dogwood, Hooker's willow, and Sitka willow. The forested wetland portion of the site also appears to be in excellent condition, and no required maintenance activities were noted. Several willows and alder have fallen into or over the marsh area either on their own or due to beaver activity, and continue to provide shade and diversity without blocking fish passage.

The emergent wetland was planted with a combination of sawbeak sedge, slough sedge, small-fruited bulrush, hardstem bulrush, and reed mannagrass. This portion of the site appeared in excellent condition and the established plants are continuing to

spread. Volunteer broadleaf cattails are present and will continue to be tracked over time. The population may require treatment if they become overly aggressive and displace other desirable species.

No vegetative disease was noted. Some invasive species were identified at the site, including reed canary grass, phragmites, pepperweed, yellow flag iris and Himalayan blackberry, and minor weeding as a part of regularly scheduled maintenance is needed. This will be an ongoing issue as there are significant parent sources for these invasive weeds upstream of the site. No new native species were noted as volunteering at the site during this inspection.

Photo Documentation – In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 16 photographs were taken at this site at tidal elevations ranging from approximately 1.28 feet MLLW to 3.08 feet MLLW. Copies of the photographs can be found in Attachment A.

4.2 THEA FOSS HABITAT ENHANCEMENT AREAS

4.2.1 Johnny's Dock Habitat Enhancement

This area is a pocket beach constructed to enhance the habitat between the Foss Landing and Johnny's Dock Marinas (see Figure 5). Prior to remediation, an old timber access pier with a brick foundation was present at the site. As part of construction of this habitat area, this structure was removed from the marine environment. A thick quarry spall cap consisting of an 18-inch deep layer of filter material overlain by an 18-inch deep layer of quarry spalls was then placed. Habitat mix was placed on the slope over the quarry spalls between elevations -10 feet MLLW and 13 feet MLLW. Saltmarsh vegetation was planted between 10 feet MLLW and 13 feet MLLW, and LWD was added to the slope to add complexity to the habitat feature.

Qualitative Ground Survey – The qualitative ground survey at this site was conducted on July 27, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in excellent condition. Upon arrival, geese and bees were present at the site. No significant signs of erosion or sedimentation were identified. A small opening "path" (approximately 5' wide) identified by a lack of vegetation possibly caused by geese (concentrated geese footprints) was noted through a portion of the slope between the LWD. Some small concrete pavers are present upland of the site on the Foss Landing property leading to this area, but only goose tracks were noted so it does not appear that the "path" has been caused by human impacts. There were no indications of disease, trash, vandalism or wrack observed. The LWD were present and in good condition.

The site was planted in accordance with the approved planting plans. A combination of pickleweed and saltgrass were planted between elevations 10 feet MLLW and 12 feet MLLW. Tufted hairgrass had been planted above that, between 12 feet MLLW and 13

feet MLLW. It was noted during the inspection that gumweed is now dominant covering nearly 100% of the upper slope, minus the goose "path" area. Saltgrass was also present but in lesser amounts than previously observed. No tufted hairgrass or pickleweed were observed during this inspection. A small amount of cudweed was also observed. A minor amount of thistle was present, but no other invasive species were noted.

Photo Documentation – In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 4 photographs were taken at this site at tidal elevations ranging from approximately -1.02 feet MLLW to -1.04 feet MLLW. Copies of the photographs can be found in Attachment A.

4.2.2 Head of Thea Foss Shoreline Habitat

A portion of the eastern shoreline at the head of the waterway was cut back as part of the Utilities' remediation project, to create aquatic habitat below ordinary high water (see Figure 6). Saltmarsh and littoral vegetation were planted in a 5- to 8-foot side strip landward of a log step structure (at approximately 12.4 feet MLLW) along the shoreline. This area was disturbed to some extent in 2012 due to the remediation of the adjacent upland property. The habitat area was protected to the extent possible and the area replanted after construction was completed.

Qualitative Ground Survey – The qualitative ground survey at this site was conducted on July 27, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in excellent condition. Upon arrival, there were bees, a ladybug, and geese present at the site. No significant erosion or sedimentation were identified. There were no indications of animal damage, disease, vandalism, trash or wrack observed at the site. The log step appeared to be in good condition.

The site was planted in accordance with the approved planting plans as modified following baseline monitoring. The plants are generally very dense, leaving little room for significant invasives. The potentilla is doing notably well and continues to dominate the northern portion of the site, while gumweed is dominant at the south end. A significant amount of tufted hairgrass was present, more than has been noted in previous years, and carex sp. was also observed in places at the top of the vegetated area. Various invasives, including pepperweed, white sweet clover, knapweed, Himalayan blackberry, Queen Anne's lace, and morning glory were found in the planting strip and in the riparian area behind. Therefore, some minor weeding is needed.

Photo Documentation – In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 6 photographs were taken at this site at tidal elevations ranging from approximately -0.85 feet MLLW to -0.98 feet MLLW. Copies of the photographs can be found in Attachment A.

4.2.3 SR 509 Esplanade Riparian Habitat

Upland vegetation was planted above the ordinary high water level along the shoreline south of Alber's Mill (see Figure 7). In order to account for shading by the SR 509 Bridge, two different assemblages of riparian vegetation were originally planted: one tree and shrub assemblage appropriate for full sun exposure, and a shrub assemblage appropriate for partial shade. An irrigation system was initially constructed under the bridge in the shaded area and was subsequently extended to the north and south ends of the enhancement area. Construction of a park on the adjacent property was completed in 2009. The sprinkler system for the habitat site has now been incorporated into the overall site sprinkler system; however its consistent operation is questionable as vandalism and transient activity are prevalent in this area. The planting area has been extended both north and south of the habitat site as part of overall site/park landscaping.

Qualitative Ground Survey – The qualitative ground survey at this site was initiated on July 25, 2018 and completed on July 27, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in fair to good condition for the portions that are not shaded by the bridge. Upon arrival, there were some pigeons, gulls and bees present at the site. No significant sedimentation or erosion were identified at the site, with the exception of some interesting "sloughing"/digging noted on the slope under the bridge. The three foot wide walking path on the slope below the high water elevation that has been noted before remains and has been extended through the majority of the site and appears to be maintained through consistent usage as well as active maintenance. There was evidence of some gumweed being pulled and stacked adjacent to the path where it likely had been encroaching on the path. It is not known how this path was constructed, although it is likely by the significant transient population who is present at the site. There were no indications of animal damage, disease, or other signs of vandalism, other than the pulling of gumweed noted above and a broken shore pine. Only minimal trash, and no wrack or organic material were present at the site

The site was planted in accordance with the approved planting plans. As indicated above, two different assemblages were originally planted due to the shading provided by the SR 509 Bridge. In the area with full sun, a combination of Pacific madrone, shore pine, oceanspray, red-flowering currant, and tall Oregon grape were planted. In the shaded area beneath the bridge, a combination of Pacific rhododendron, salal, and red huckleberry were planted. Overall, the plants outside of the shading of the bridge were observed to be doing well while there are few plants present in the area under the bridge. Even invasives and other weeds are not establishing in the shaded area. It is unclear whether this is due to ongoing issues with the sprinkler system or is an issue of a lack of direct sunlight, disturbance, and/or poor site conditions. The southern portion of the riparian area has more natives/vegetation in general as compared to the north end, while the north end has greater salt marsh diversity in the lower elevations with lamb's quarter, pickleweed, goose tongue fleshy jaumea, saltgrass, brass buttons sand spurry and tufted hairgrass all observed. The WCC mows the grass in the upper

portions of the site adjacent to the esplanade at the request of the Foss Waterway Development Authority who is invested in the aesthetics of the area.

In addition to the marsh plants noted above, gumweed continues to volunteer at the site, and is spreading nicely in the adjacent intertidal area with some plants even establishing under the bridge. Some invasive weeds were found including thistle and pepperweed. Therefore, some weeding is needed throughout the site, particularly at the north end.

Photo Documentation – In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 12 photographs were taken at this site at tidal elevations ranging from approximately -0.47 feet MLLW to -0.85 feet MLLW. Copies of the photographs can be found in Attachment A.

4.2.4 Log Step Habitat Enhancement

Approximately 35 treated timber piling, a 12- by 14-foot concrete vault, and other debris were removed from an area on the west side of the waterway between the Colonial Fruit warehouse and the Foss Harbor Marina. A portion of the area was dredged, and a thick quarry spall cap consisting of 18 inches of filter material overlain by 18 inches of riprap was constructed. Habitat mix was placed over the area between the elevations of -10 feet MLLW and 11 feet MLLW (see Figure 8).

A 2-step log transition was constructed between elevations 11 feet MLLW and 13 feet MLLW and a 3-foot bench was constructed using 18 inches of filter material overlain with an 18-inch deep layer of quarry spalls. Habitat mix was placed over the quarry spalls, and saltmarsh grasses planted at elevation 13 feet MLLW along the 65-foot long high intertidal bench.

Qualitative Ground Survey – The qualitative ground survey at this site was initiated on July 25, 2018 and completed on July 27, 2018. A copy of the completed field form can be found in Attachment A. Overall, the site was noted to be in excellent condition. Upon arrival, there were crabs and small fish observed at the site along the shoreline. No significant erosion or sedimentation were identified. There were no indications of animal damage, disease, vandalism, trash, wrack, or other organic debris observed. The log step appeared to be in good condition, although the cables should be checked and tightened as needed. An additional long log remains present on site and is attached with a chain to the existing LWD in the south half of the site. It is not causing any damage to the enhancement site in its current location, nor does it appear to have the potential to cause any issues of concern.

The site was originally planted in accordance with the approved planting plans. A combination of American dunegrass and tufted hairgrass was planted in a 3-foot wide bench behind the log step at an elevation of approximately 13 feet MLLW. It was noted during this inspection that the dunegrass is continuing to do very well, is spreading, and

is the dominant species, particularly in the north half of the site. The south half of the site is more diverse, with more gumweed, pickleweed, fleshy jaumea and goose tongue present. No tufted hairgrass was observed at the site. Himalayan blackberry was observed adjacent to the top of the site, and the few plants should be spot sprayed.

The Foss Waterway Development Authority is planning an upland park in this area, and the City will coordinate with them during design to ensure that the habitat function at this enhancement area is maintained.

Photo Documentation – In accordance with the LTMP, photographs taken during this inspection were for the purpose of showing general site conditions. A total of 3 photographs were taken at this site at tidal elevations ranging from approximately -0.19 feet MLLW to -0.30 feet MLLW. Copies of the photographs can be found in Attachment A.

4.3 SLOPE REHABILITATION AREAS

4.3.1 Wheeler-Osgood Waterway (Remedial Areas 11, 13, and 10)

As part of the remedial action, slope rehabilitation activities were performed in 2002 along most of the intertidal shoreline in the Wheeler-Osgood Waterway, including approximately half of RA 11, all of RA 13, and all of RA 10 (refer to Figure 9). These slope rehabilitation activities included the removal of anthropogenic debris (e.g., concrete, piling, etc.) and/or the placement of import material (e.g., armoring, habitat mix, etc.) to stabilize, flatten, and/or provide more suitable habitat.

The Year 12 visual inspection of the slope rehabilitation areas in the Wheeler-Osgood Waterway began at the western end of the slope rehabilitation area in RA 11 and continued eastward through RA 11, then into RAs 13 and 10, before finishing at the western end of the slope rehabilitation area in RA 10. The start and end points for the Wheeler-Osgood Waterway slope rehabilitation inspection are shown on Figure 9. A brief summary of the key observations made in each RA during the Year 12 visual inspection is provided below.

Remedial Area 11

The RA 11 slope rehabilitation area extends approximately 450 lineal feet. The western portion of the slope rehabilitation area in RA 11 generally consists of an upper slope covered primarily with riprap and a lower slope covered primarily with sand and silt, along with some scattered riprap (Year 12_RA-11_P1020438 through Year 12_RA-11_P1020441). The remaining eastern portion of the RA 11 slope rehabilitation area generally consists of sand and silt, with some scattered riprap and quarry spalls also present (Year 12_RA-11_P1020442 through Year 12_RA-11_P1020444; Attachment B). In this eastern section of RA 11, coarse sand was present beneath a layer of silt at the base of this slope. This coarse sand is likely the backfill material that was placed in RA 12 as part of the remedial action.

Piling ends were observed near the top of the slope throughout the RA 11 slope rehabilitation area.

Two known private outfalls are present within the RA 11 slope rehabilitation area, one near the western end of the slope rehabilitation area and one at the boundary of the RA 11 and RA 13 slope rehabilitation areas (Figure 9). Another outfall was also observed located between these two known outfalls. There was no discharge observed from these three outfalls. Some groundwater seepage was observed on the slope just east of the western outfall.

No areas of concern were identified in the RA 11 slope rehabilitation area and no follow-up actions are needed at this time.

Remedial Area 13

The RA 13 slope rehabilitation area extends approximately 960 lineal feet.

The southern shoreline of RA 13 generally consists of an upper slope covered with either quarry spalls or riprap. Below this upper portion of the slope, an area of coarse sand and gravel is generally present, sometimes with another area of quarry spalls observed on the slope below this coarse sand and gravel area. The lowest portion of the slope is predominately covered with silt and sand, overlying coarse sand (backfill material) that was placed in RA 12 (Year 12_RA-13_P1020445 through Year 12_RA-13_P1020450; Attachment B). Piling ends were observed near the top of the slope in a portion of the southern shoreline in RA 13.

At the head of the Wheeler-Osgood Waterway, the slope to the southwest of City of Tacoma Outfall 254 primarily consists of sand and gravel (Year 12_RA-13_P1020451; Attachment B). There is also a private outfall located just southwest of Outfall 254 on this slope (Figure 9). No discharge was observed coming out of this private outfall; however, some groundwater seepage was observed on the slope just below this outfall. Baseflow/tidal water was observed discharging from Outfall 254 during the inspection. The slope just northwest of Outfall 254 generally was covered with quarry spalls on the upper slope and silt, sand, and gravel on the lower slope (Year 12_RA-13_P1020452 through Year 12_RA-13_P1050454; Attachment B). A groundwater seep was observed on the slope northwest of Outfall 254.

The northern section of the RA 13 shoreline, extending approximately 300 linear feet, is also generally covered with cobbles, sand, and gravel, with some portions of the upper slope also containing quarry spalls (Year 12_RA-13_P1020455, Year 12_RA-13_P1020459, and Year 12_RA-13_P1020464 through Year 12_RA-13_P1020466; Attachment B). A capped area, referred to as the Sheen Source Removal Area, is located adjacent to this northern portion of the RA 13 slope rehabilitation area from approximately Station 15+50 to Station 16+15 (Figure 9). The Sheen Source Removal Area cap is composed of channel sand cap material (i.e., coarse sand). The slope cap

inspection that occurred within the Sheen Source Removal Area is documented in detail in the Year 12 Low-Tide Slope Cap Inspections PFM (City of Tacoma 2018b).

On the RA 13 northern shoreline, beginning in the Sheen Source Removal Area and extending westward along the lower portion of the slope, a slight milky blue sheen was observed on the surface of the water accumulating at the base of slope in certain areas. A few isolated sheen spots were noted within the Sheen Source Removal Area (Year 12_RA-13_P1020458; Attachment B). One of the largest areas where this sheen was observed was located at the base of the slope adjacent to and west of the Sheen Source Removal Area, with the sheen in this area present on the water's surface and covering an area approximately 10 feet by 15 feet (Year 12_RA-13_P1020460; Attachment B). Further westward in RA 13, another sheen area was observed covering an area approximately 20 feet by 20 feet (Year 12_RA-13_P1020467; Attachment B). The other areas with sheen observed along the northern shoreline of RA 13 tended to be smaller, isolated spots. The source of this sheen is unknown, but the sheen may be biological in nature. There was no odor associated with this sheen. A similar sheen was observed within the Sheen Source Removal Area, at the base of the slope on the water's surface, during the previous inspections performed in this slope cap area in Year 7 and Year 10.

A known private outfall is located near the western end of the northern shoreline in RA 13 (Figure 9). There was also one additional outfall observed at the boundary of the RA 13 and RA 10 slope rehabilitation areas. There was no discharge observed from either outfall.

Following, the slope rehabilitation inspections in the Wheeler-Osgood Waterway, the United States Environmental Protection Agency (USEPA) requested that grab samples of the milky blue sheen observed on the waterway's northern slope (within both RA 13 and RA 10) be collected during a low tide in early August for the analysis of polychlorinated biphenyls (PCBs) and total petroleum hydrocarbons (TPH). The City visited the site during low-tide conditions on August 9, 2018. Upon arrival, there was very little sheen observed in RA13 relative to the amount seen during the July inspection. However, later in the tidal cycle, some sheen was observed and a sample containing this sheen was collected from the waterway's northern slope in RA 13. This sample was collected in the same area where the sheen was observed to be the most predominant in RA 13 on the day of the initial inspection. A second sample containing this sheen was collected within RA 10, as a similar sheen was also observed in portions of the RA 10 slope rehabilitation area. These samples were submitted to the City of Tacoma laboratory for the analysis of PCBs and TPH, as well as polycyclic aromatic hydrocarbons (PAHs) and total organic carbon (TOC). Field documentation regarding this sample collection, a figure showing the locations of where sheen samples were collected, and the analytical results for the samples will be reported in the Year 12 Monitoring Event Report. No additional follow-up actions are recommended in RA 13 based on the Year 12 inspection. RA 13 will continue to be monitored during future LTMP slope rehabilitation inspections.

Remedial Area 10

The RA 10 slope rehabilitation area extends approximately 1,000 lineal feet. The eastern third of the RA 10 shoreline slope surface generally consists of gravel or sand with some scattered quarry spalls or cobbles (Year 12_RA-10_P1020468 through Year 12_RA-10_P1020475; Attachment B). Piling ends were observed near the top of the slope throughout most of this eastern third of the RA 10 slope rehabilitation area. Moving westward, the upper slope surface changes at the eastern end of the Marine Floats docks. In this area, the upper slope has much more debris on the surface, consisting of concrete blocks and some metal, mixed in some quarry spalls and riprap (Year 12_RA-10_P1020476 through Year 12_RA-10_P1020478; Attachment B). Additionally, piling ends were observed in this upper portion of the slope. The lower slope is a mixture of silt, sand, and gravel in this area. Near the western end of the Marine Floats docks, the slope surface transitioned primarily to sand with some gravel (Year 12_RA-10_P1020479 and Year 12_RA-10_P1020480; Attachment B). The remainder of the RA 10 slope to the west of the Marine Floats docks generally consisted of cobbles, gravel, and sand, with some of these areas showing significant accumulations of shell debris and worm casings on the lower portion of the slope (Year 12_RA-10_P1020481 through Year 12_RA-10_P1020484; Attachment B).

The same slight milky blue sheen observed in RA 13 was also observed on the surface of the water accumulating at the base of slope in portions of RA 10. An approximately 25-foot long stretch of the lower slope, located in the eastern third of the RA 10 shoreline, was observed to have scattered sheen spots present. Additional areas of sheen were observed in an approximately 20-foot long stretch of the shoreline located near the eastern end of the Marine Floats docks. Scattered sheen spots were also observed over an approximately 25-foot long stretch of the shoreline near the western end of RA 10 shoreline.

Some groundwater seepage was observed on the slope in RA 10 approximately 25 feet west of the boundary between the RA 13 and RA 10 slope rehabilitation areas (Year 12_RA-10_P1020468; Attachment B). Groundwater seepage was also observed on the slope near the eastern end of the Marine Floats docks.

Two private outfalls were observed in the RA 10 slope rehabilitation area (Figure 9). There was no discharge observed from either outfall.

At the request of USEPA, a sample containing the observed milky blue sheen was collected from the waterway's northern slope in RA 10 during low-tide conditions on August 9, 2018. This sample was collected in an area where the sheen was observed to be the most predominant in RA 10 on the day of sampling. As discussed above under the RA 13 summary, a second sample containing a similar sheen was collected from RA 13 during the same sampling event. These samples are being analyzed for PCBs, TPH, PAHs, and TOC and the results from these samples will be reported in the Year 12 Monitoring Event Report, along with field documentation and a figure showing the sample locations. No additional follow-up actions are recommended in RA 10 based on

the Year 12 inspection and this area will continue to be monitored during future LTMP slope rehabilitation inspections.

4.3.2 Remedial Area 15

As part of the remedial action, slope rehabilitation activities were performed in a portion of the intertidal shoreline within RA 15, located on the eastern side of the Thea Foss Waterway (Figure 9). The slope rehabilitation activities in RA 15 included removing timber piles and debris, filling and dredging to help stabilize the steep slope, and covering the new slope surface with 18-inches of slope filter material, 18-inches of quarry spalls and riprap, and then applying habitat mix over the quarry spall surface.

The Year 12 visual inspection of the RA 15 slope rehabilitation area was initiated from the southern boundary of this area and continued to the northern boundary. The start and end points for the RA 15 slope rehabilitation inspection are shown on Figure 9. During the Year 12 inspection, the entire RA 15 slope surface was observed to be a mixture of quarry spalls and riprap with habitat mix (Year 12_RA-15_P1020427 through Year 12_RA-15_P1020437; Attachment B). Sediment accretion and/or settlement of fines were observed near the waterline.

Two outfalls, City of Tacoma Outfalls 248 and 249 are present within the RA 15 slope rehabilitation area (Year 12_RA-15_P1020429 and Year 12_RA-15_P1020435, respectively; Attachment B). Baseflow/tidal water was observed discharging from both of these outfalls, but did not appear to be disturbing the slopes beneath these outfalls. Some groundwater was observed to be seeping through the sheet pile wall adjacent to the southern end of this slope rehabilitation area through constructed weep holes.

No areas of concern were identified in the RA 15 slope rehabilitation area and no follow-up actions are needed at this time.

5.0 Summary of Preliminary Findings

5.1 SUMMARY OF PRELIMINARY FINDINGS FOR HABITAT MITIGATION AND ENHANCEMENT AREAS

The purpose of the habitat mitigation/restoration area long-term monitoring program is to evaluate and ensure the ongoing success in development and maintenance of the habitat mitigation/restoration areas constructed as part of the Thea Foss and Wheeler-Osgood Waterways Remediation Project.

It should be noted that the primary performance criteria for the mitigation sites originally established was for the maintenance of the total habitat acreage for the project, whereas the habitat enhancement areas were designed to enhance the habitat function where possible within the remediated areas.

Very few follow-up actions were identified during this monitoring event. Those that were identified are discussed in the sections above, and are summarized in Table 1. In general, maintenance activities required include minor invasive removal and trash removal, at all sites, with more significant coordination of cleanup from encampment activity required at the Puyallup River Side Channel and the Middle Waterway Tideflat Habitat. All LWD need to have the anchors checked and tightened periodically. At the four mitigation sites, any remaining stakes and irrigation system components can be removed. Finally, supplemental plantings will be done at the Puyallup River Side Channel in a continued effort to eliminate social trails and prevent transient activity, as well as at the Hylebos Creek Mitigation site to help shade out the reed canary grass.

The status of these follow-up actions will be discussed in the Year 12 Monitoring Event Report.

5.2 SUMMARY OF PRELIMINARY FINDINGS FOR SLOPE REHABILITATION AREAS

No concerns were identified upon inspection of the slope rehabilitation areas within RA 11 and RA 15 in Year 12.

Throughout portions of the northern shoreline in RA 13 and the shoreline in RA 10, a slight milky blue sheen was observed on the water's surface in the lower portion of the slopes, generally in areas where water was observed accumulating on the slope surface. The source of the sheen could not be determined but may be biological in nature. At the request of USEPA, two samples containing this observed sheen were collected from the waterway's northern slope during low-tide conditions on August 9, 2018. One sample was collected in RA 10 and one sample was collected in RA 13. The samples were collected in areas where the sheen was observed to be the most predominant in these RAs on the day the sampling occurred. These samples were submitted to the City of Tacoma laboratory for the analysis of PCBs, TPH, PAHs, and TOC. Field documentation regarding this sample collection, a figure showing the locations of where the sheen samples were collected, and the analytical results for these samples will be reported in the Year 12 Monitoring Event Report. Additionally, as part of the Year 12 LTMP monitoring activities, two Waterway Source samples (WS-4 and WS-5) are collected within the Wheeler-Osgood Waterway adjacent to these slope rehabilitation areas. The chemical data from these two Waterway Source samples will be examined in the Year 12 Monitoring Event Report relative to these sheen observations. No other response actions are proposed for RA 10 and RA 13.

The RA 10, 11, 13, and 15 slopes will continue to be inspected during future LTMP slope rehabilitation inspections.

5.3 FUTURE HABITAT MITIGATION AREA AND SLOPE REHABILITATION AREA INSPECTIONS

The next round of habitat mitigation area monitoring and slope rehabilitation inspection activities is scheduled for Year 17 (2023). Year 17 monitoring activities will include qualitative monitoring as well as representative photo documentation at the mitigation and enhancement sites. Year 17 monitoring at the slope rehabilitation sites will include visual inspections and representative photo documentation of conditions at RA 10, 11, 13 and 15. These activities are scheduled to be conducted in June or July 2023, during appropriate tidal cycles.

6.0 References

City of Tacoma. 2018a. Thea Foss and Wheeler-Osgood Waterways Remediation Project, Long Term Monitoring Plan. May.

City of Tacoma. 2018b. Thea Foss and Wheeler-Osgood Waterways Remediation Project, Year 12 Monitoring Low-Tide Slope Cap Inspections Preliminary Findings Memorandum. 27 July.

Table

Table 1 Summary of Preliminary Findings

Figures

Figure 1 North Beach Habitat
Figure 2 Middle Waterway Tideflat Habitat
Figure 3 Puyallup River Side Channel
Figure 4 Hylebos Creek Mitigation Site
Figure 5 Johnny's Dock Habitat Enhancement
Figure 6 Head of Thea Foss Shoreline Habitat
Figure 7 SR509 Esplanade Riparian Habitat
Figure 8 Log Step Habitat Enhancement
Figure 9 Habitat Enhancement and Slope Rehabilitation Areas

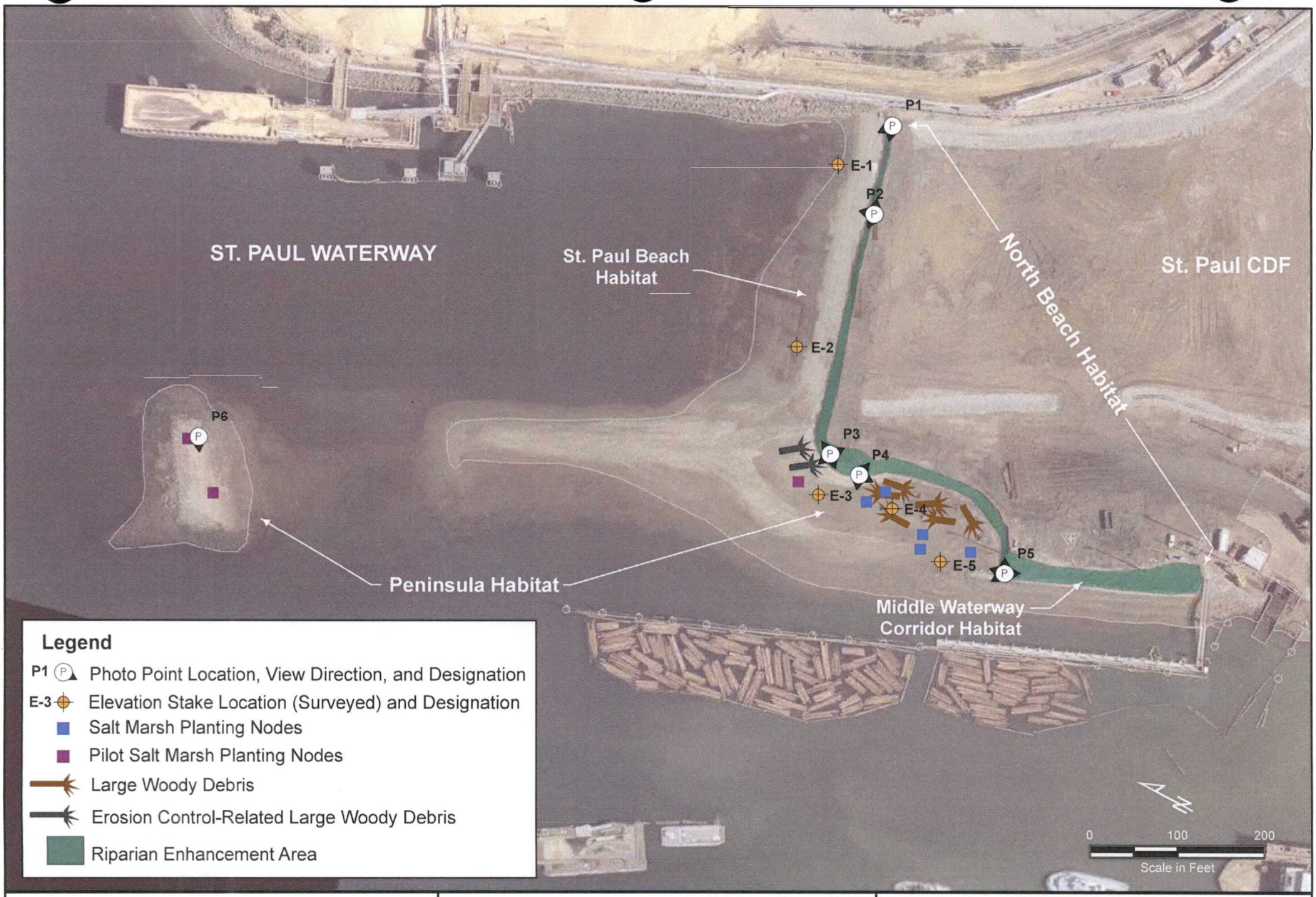
Attachments

Attachment A – Habitat Mitigation Area Monitoring Field Forms and Photographs
Attachment B – Slope Rehabilitation Monitoring Field Notes and Photographs

- Wheeler Osgood Waterway (Remedial Areas 11, 13, and 10)
- Remedial Area 15

Table 1
Summary of Preliminary Findings

Site	Corrective Action Tasks
North Beach Habitat	- minor weeding - minor trash removal - check and tighten anchors on large woody debris, as needed
Middle Waterway Tideflat Habitat	- lock/chain gate mid-site - remove irrigation shed and other stakes and remaining irrigation system - minor weeding - coordinate removal of transient camp mid-site - check and tighten anchors on large woody debris, as needed
Puyallup River Side Channel	- minor weeding - coordinate transient/trash removal - supplemental planting on pathway on old levee
Hylebos Creek Mitigation Site	- minor weeding - check and tighten anchors on large woody debris, as needed - consider planting willow stakes to help shade out reed canary grass
Johnny's Dock Habitat Enhancement	- check and tighten anchors on large woody debris, as needed
Head of Thea Foss Shoreline Habitat	- minor weeding - check and tighten anchors on logs, as needed
SR 509 Esplanade Riparian Habitat	- minor weeding - weedeat around plants
Log Step Habitat Enhancement	- spot spray blackberry in adjacent area - check and tighten anchors on logs as needed



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Thea Foss and Wheeler-Osgood Waterways LTMP

Figure E-5
North Beach Habitat
Year 0 Modification

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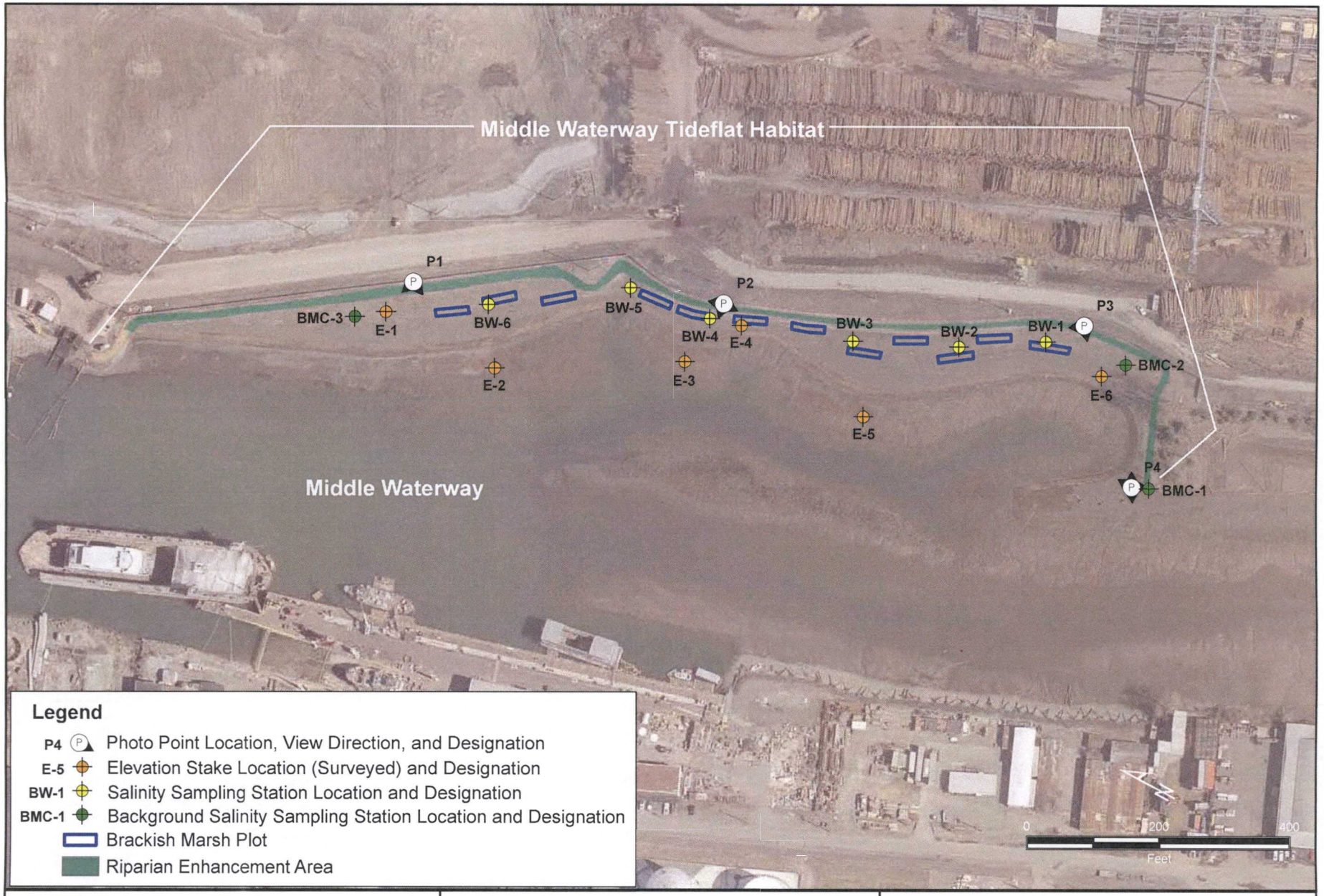

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Thea Foss and Wheeler-Osgood Waterways LTMP

Figure E-6
Middle Waterway Tideflat Habitat

DATE: 13/2006 4:19:56 PM
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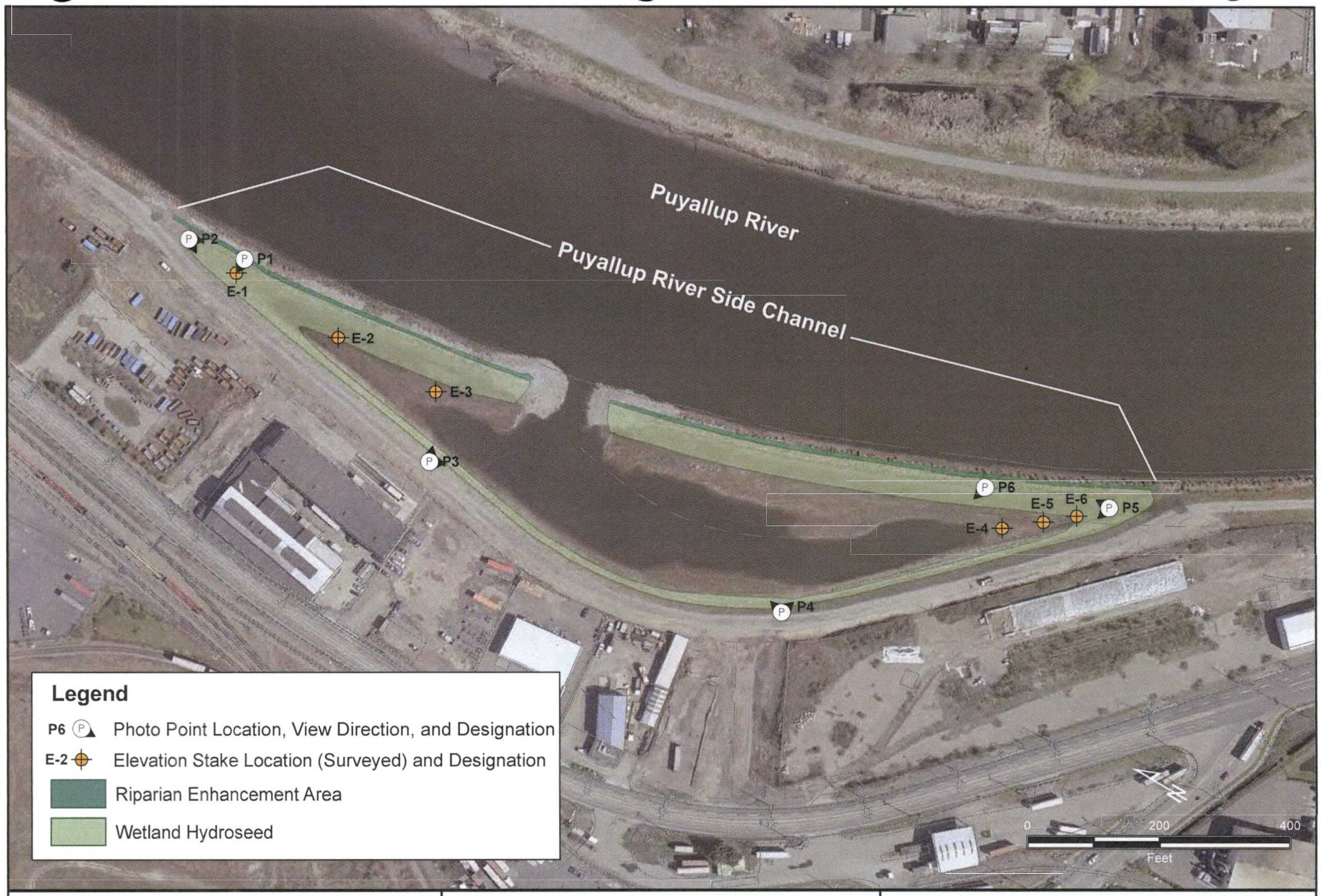

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Thea Foss and Wheeler-Osgood Waterways LTMP

Figure E-7
Puyallup River Side Channel

DATE: 12/13/2006 4:40:30 PM
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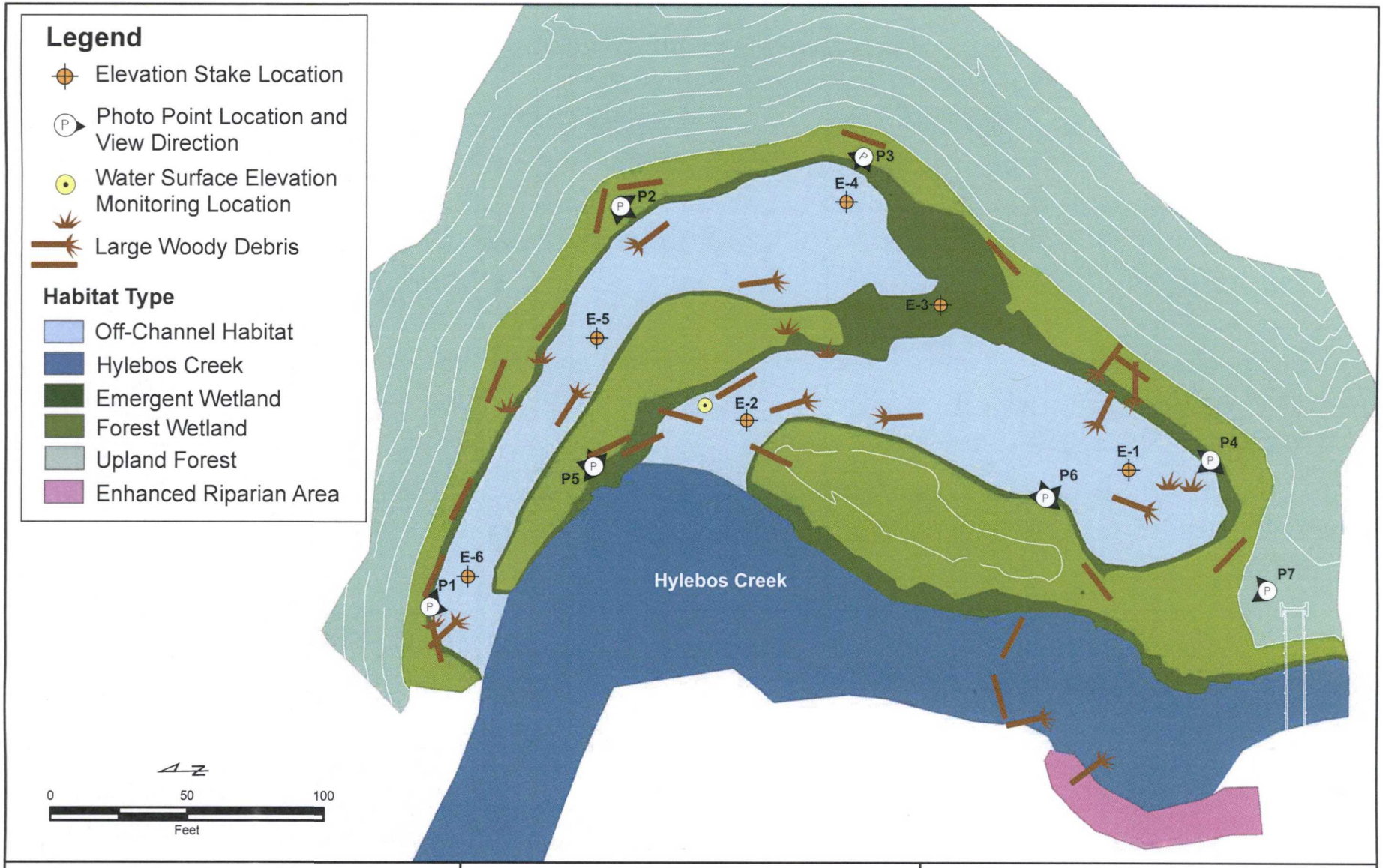

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Thea Foss and Wheeler-Osgood Waterways LTMP

Figure E-8
Hylebos Creek Mitigation Site

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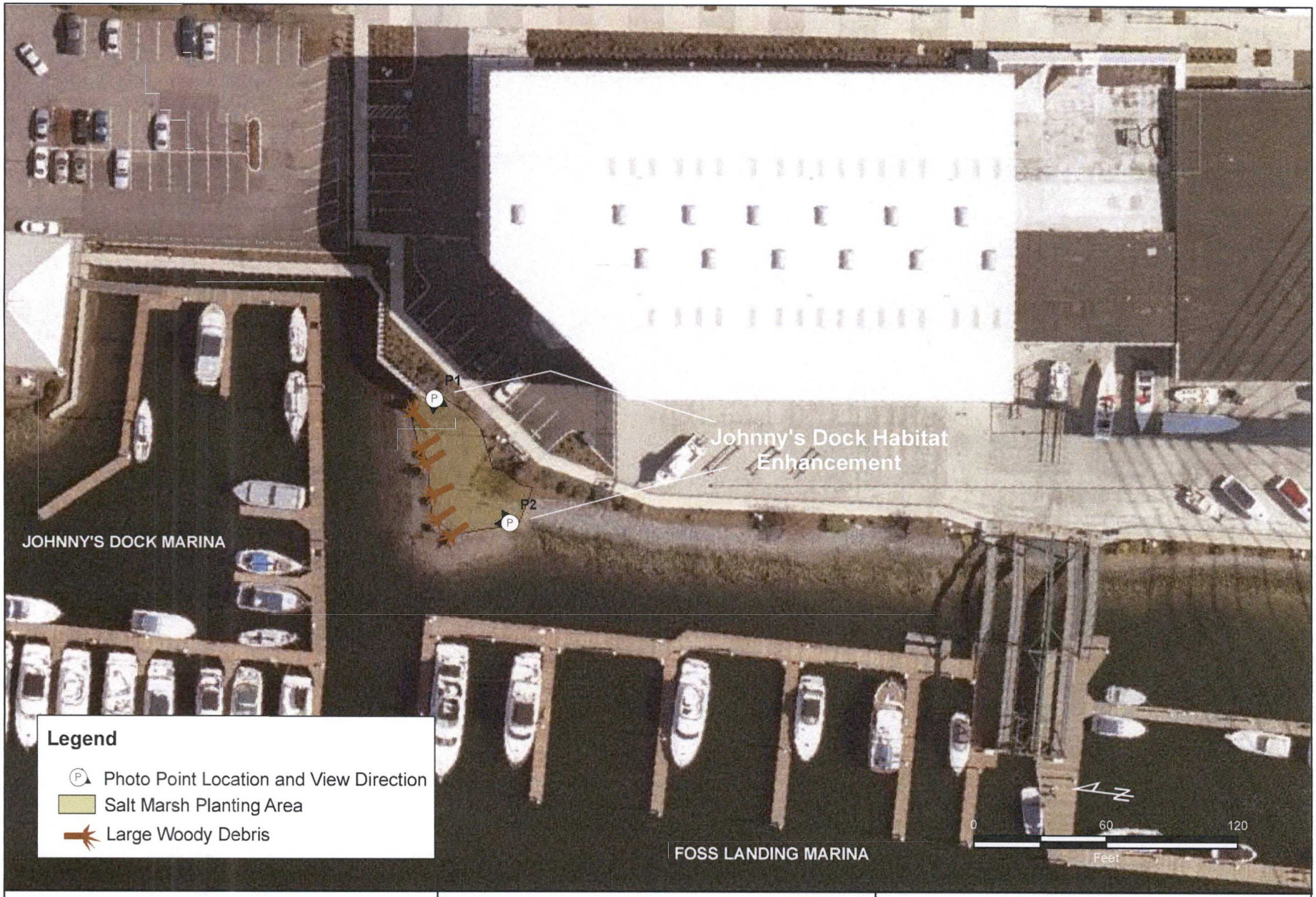

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Thea Foss and Wheeler-Osgood Waterways LTMP

Figure E-2
Johnny's Dock Habitat Enhancement

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Thea Foss and Wheeler-Osgood Waterways LTMP

Figure E-1
Head of Thea Foss Shoreline Habitat

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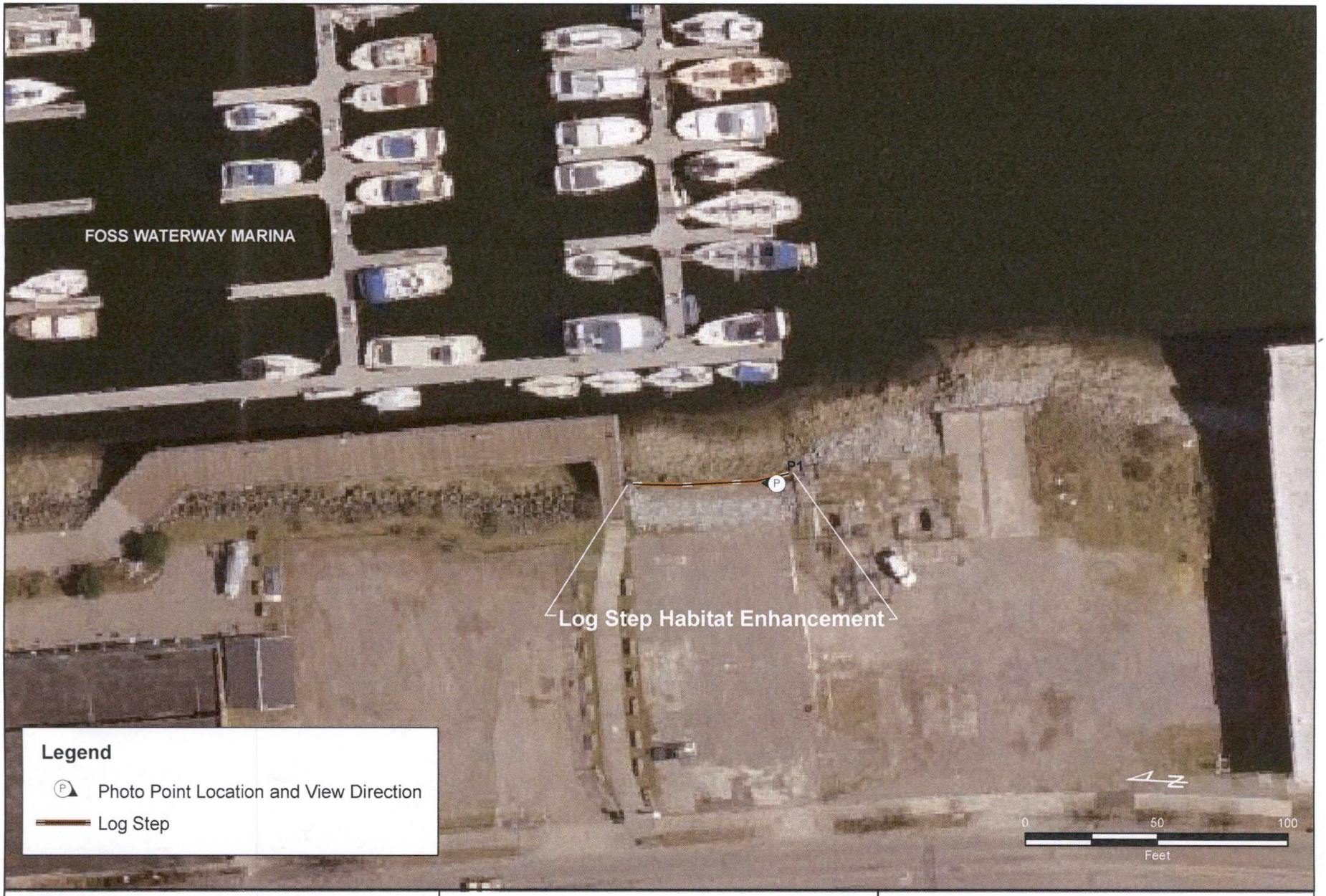
Thea Foss and Wheeler-Osgood Waterways LTMP

Figure E-3
SR 509 Esplanade Riparian Habitat

DATE: 8/9/2006 8:13:03 AM
MXD NAME: F:\projects\KPFF Foss\GIS\Revised OMMP\Habitat Mitigation Areas Monitoring\Figure E-3 (Esplanade Photo Point Locations).mxd



Tacoma

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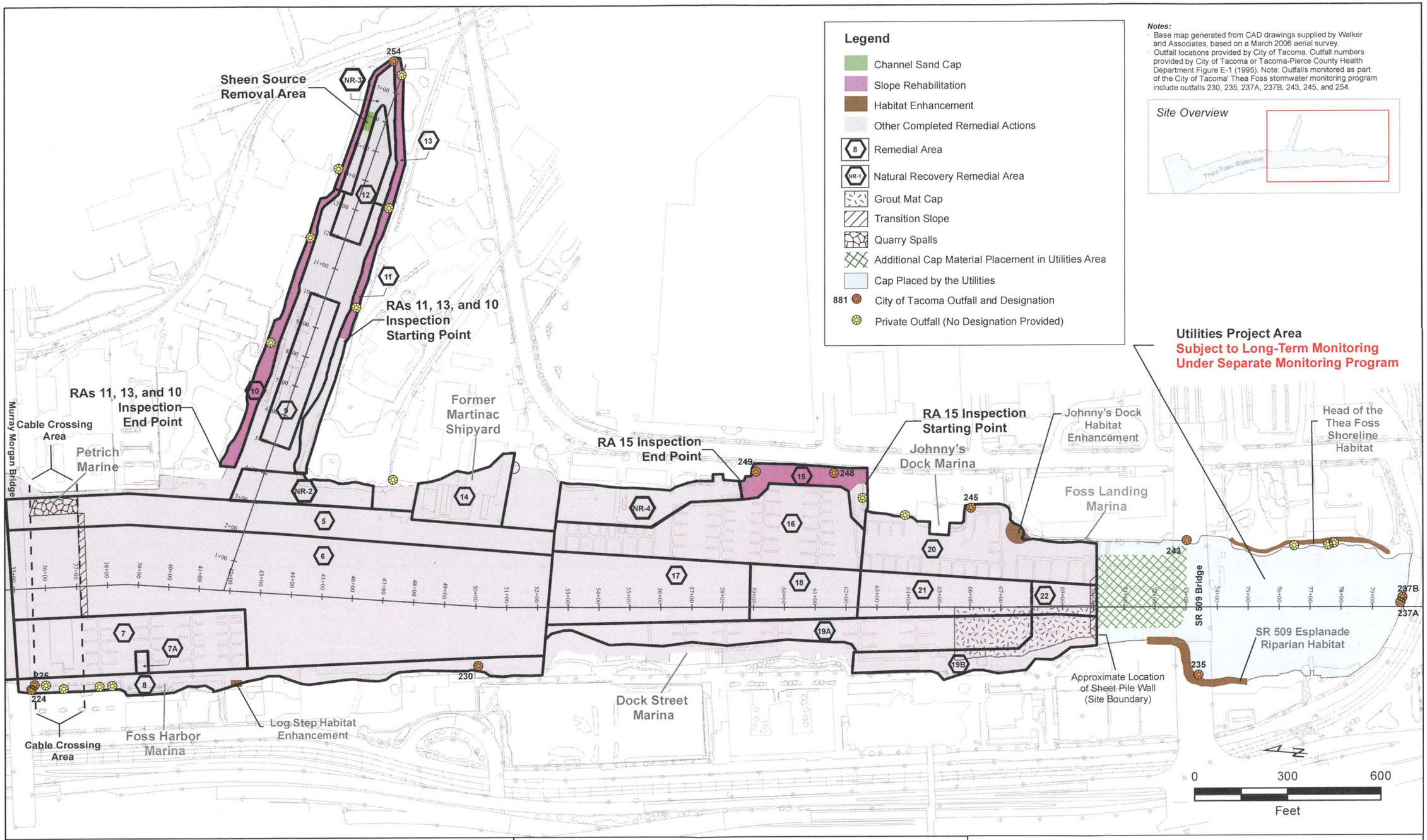
ENVIRONMENTAL CONSULTANTS

Thea Foss and Wheeler-Osgood Waterways
LTMP

Figure E-4
Log Step Habitat Enhancement

DATE: /14/2006 8:04:44 AM
MXD NA projects\KPFF Foss\GIS\Revised OMMP\Habitat Mitigation Areas Monitoring\Figure E-4 (Foss Marina Photo Poi ons).mxd



Legend

- Channel Sand Cap
- Slope Rehabilitation
- Habitat Enhancement
- Other Completed Remedial Actions
- 8 — Remedial Area
- NR-1 — Natural Recovery Remedial Area
- Grout Mat Cap
- Transition Slope
- Quarry Spalls
- Additional Cap Material Placement in Utilities Area
- Cap Placed by the Utilities
- 881 — City of Tacoma Outfall and Designation
- Private Outfall (No Designation Provided)

Notes:

- Base map generated from CAD drawings supplied by Walker and Associates, based on a March 2006 aerial survey.
- Outfall locations provided by City of Tacoma. Outfall numbers provided by City of Tacoma or Tacoma-Pierce County Health Department Figure E-1 (1995). Note: Outfalls monitored as part of the City of Tacoma' Thea Foss stormwater monitoring program include outfalls 230, 235, 237A, 237B, 243, 245, and 254.

Site Overview

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Thea Foss and Wheeler-Osgood Waterways LTMP

Figure 9
Habitat Enhancement and Slope Rehabilitation Areas

File: I:\GIS\Projects\COT_ON_CALL\MXD\2018 Low-Tide Memo\Figure 9 Habitat Enhancement and Slope Rehabilitation Areas.mxd
Date: 8/6/2018

Attachment A

Habitat Mitigation Area Monitoring Field Forms and Photographs

North Beach Habitat

Qualitative Site Evaluation

Date: 7.24.18 Time: 10:25 am Year: 12 (2018), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: D. Radice, M. Henley, J. Cunnington, K. Koch (EPA) hunter. Todd Clarke.

Weather Conditions: sunny, hot.

River Discharge* (CFS) (PRSC & HCH only):

Overall health and vigor of plants: Excellent (Fair) Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion			CDF front, looks like its closer to angle of repose - see pics.
Sedimentation			gravel movement noted, regreading.
Wildlife Presence	Y	Y	crabs, crows, gull, tern.
Vegetation: Planted/Native	Y		dry!!
Invasive	Y		minimal, blackberry
Animal Damage			geese eaten dune grass.
Disease (Vegetation)			none noted.
Human Impacts: Trash			plastic fluff near W. Rock,
Vandalism			none noted. (survey crew cut vegetation)
Large Woody Debris (Installed/Recruitment)			none noted - recruitment. / installed - yes.
Wrack or Organic Material		Y	push near W Rock, some in S. marsh.

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

geese, cormorant, great blue heron. seal, starlings

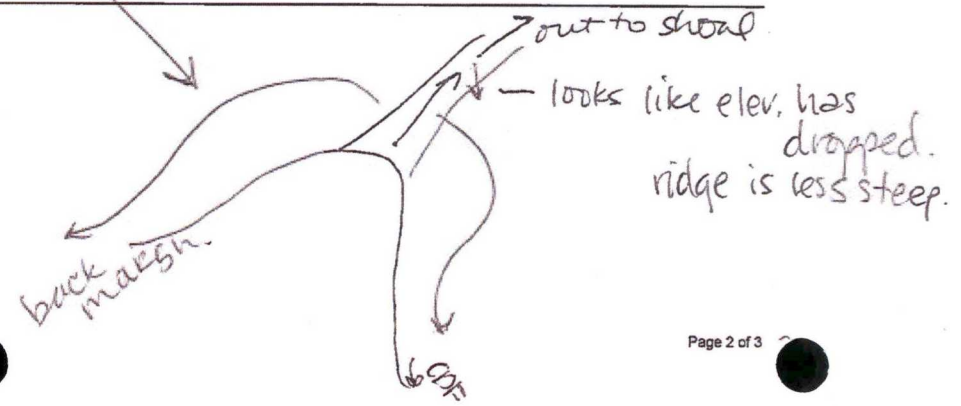
Any indication of fish obstruction in the channels? (HCH only) n/a

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only:

yes.

Notes:

seeps present near W. Rock end of CDF
dune grass not doing as well w/ large log missing (CDF front)
2 concrete floats in salt marsh → likely from ~~Stan~~ log haul out
fleshy jaumea is plentiful in back marsh
Dune grass eaten (geese?) is having an off year
lots of gravel push



Representative Photo Locations (Record Picture # and Time):

Year: 12 (2018), 17 (2023), 22 (2028)

Site: No. Beach.
Date: 7.26.18

Location Description	Direction of Photo	Time	Approximate Tide
N. Beach 024, 025	E/W from W end of COF 2	11:05	-1.08
N. Beach 026 027	@ pt. E/W/N 3	11:06	-1.08
N. Beach 028 029	Salt Marsh (S) looking	11:11	-1.05
" " 030	Salt Marsh looking (N)	11:15	-1.03
" " 031	Upland cuts	11:20	-0.99
one other pic noted on MWTF log (see below)			
front of COF from east end berm 022, 023	W, NW	10:57	-1.09

Year 12 North Beach (NB) Photographs

Year 12_NB_022 7/26/2018 10:57 AM

Year 12_NB_023 7/26/2018 10:57 AM

Year 12_NB_024 7/26/2018 11:05 AM

Year 12_NB_025 7/26/2018 11:05 AM

Year 12_NB_026 7/26/2018 11:06 AM

Year 12_NB_027 7/26/2018 11:06 AM

Year 12_NB_028 7/26/2018 11:11 AM

Year 12_NB_029 7/26/2018 11:11 AM

Year 12_NB_030 7/26/2018 11:15 AM

Year 12_NB_031 7/26/2018 11:20 AM

Middle Waterway Tideflat Habitat

Lock up gate. mid site

Qualitative Site Evaluation

Date: 7/25/18 Time: 12:15pm Year: 12 (2018), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: D. Radice, M. Henley, J. Barton (EPA) 7/26 + J. Cunnington, K. Koch, - J Barton

Weather Conditions: sunny hot

River Discharge* (CFS) (PRSC & HCH only): n/a

Overall health and vigor of plants: (Excellent) Fair Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion		ϕ	some w/seeps; minor / @ end by light pole / fence.
Sedimentation			none noted.
Wildlife Presence	ϕ	ϕ	dead tern & gull, terns, geese, gulls, starlings clams. sand bees. GBH
Vegetation: Planted/Native		ϕ	diversity has increased - fleshy jaumea
Invasive			BB, minimal.
Animal Damage			geese eating goose tongue
Disease (Vegetation)			none noted.
Human Impacts: Trash			encampment SO of pole / gate. / high tide line
Vandalism			none noted.
Large Woody Debris (Installed/Recruitment)			log booms on beach
Wrack or Organic Material		ϕ	minimal: <1%

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

terns, gulls, blue [illegible] (2)

Any indication of fish obstruction in the channels? (HCH only)

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only:

n/a.

Notes:

encampment ID'd SO of pole (mid site)
dead trees in rip area (alder & conifer)
wood debris exposed near well post w/ seep.
algal mat present.
take down shed / work w/
remove stakes and vissigation remaining.

Representative Photo Locations (Record Picture # and Time):

Year: 12 (2018), 17 (2023), 22 (2028)

Site: MWTH

Date: 7·26·18

Location Description		Direction of Photo	Time	Approximate Tide
From South end - overall site	017	N	9:59	-0.38
" "	018	N	10:00	-0.40
" "	019	N	10:00	-0.40
From South end - overall sit	020	E	10:00	-0.40
" "	021	E	10:00	-0.40
Erosion at north end MH ~~022~~	036	N	11:40	-0.72
From north end of site	037	S	11:41	-0.71
Across mid-site previous erosion area	038	S	11:54	-0.42

Year 12 Middle Waterway Tideflat (MWT) Photographs

Year 12_MWT_017 7/26/2018 9:59 AM

Year 12_MWT_018 7/26/2018 10:00 AM

Year 12_MWT_019 7/26/2018 10:00 AM

Year 12_MWT_020 7/26/2018 10:00 AM

Year 12_MWT_021 7/26/2018 10:00 AM

Year 12_MWT_036 7/26/2018 11:40 AM

Year 12_MWT_037 7/26/2018 11:41 AM

Year 12_MWT_038 7/26/2018 11:54 AM

Puyallup River Side Channel

Qualitative Site Evaluation

Date: 7/25/18 Time: 10:45 am Year: 12 (2018), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: D. Radice, M. Henley, J. Barton (EPA)

Weather Conditions: Sunny, Hot

River Discharge* (CFS) (PRSC & HCH only): MH 2110 ~~1450~~ ft3/s H.23' MH 11.39 ft

Overall health and vigor of plants: (Excellent) Fair Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion		✓	tidal drainage (assoc. w/)
Sedimentation		✓	Regrading/distribution of sediment → resulting in lessening of slope on river side of inside area.
Wildlife Presence	✓		beaver – 5" alder cut on rve. edge.
Vegetation: Planted/Native			cattails, rushes,
Invasive			tansy, ~~smartweed~~ (?), swt dvr, blackberry, ~~borage?~~ butterfly bush.
Animal Damage	✓		willow borer, leaf worm/caterpillar
Disease (Vegetation)			none noted.
Human Impacts: Trash	✓		@ no end arm pt. & all along the trail – needs cleaning.
Vandalism			none noted.
Large Woody Debris ~~(Installed)~~/Recruitment)		✓	some med sized LWD @ mouth; nothing very large
Wrack or Organic Material			@ south end mush (upstream end)

common cow parsnip OK!

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

crows, cormorant, bees, killdeer, gulls

Any indication of fish obstruction in the channels? (HCH only) —

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only:

n/a

Notes:

Propane tank
styrofoam & other trash.
√on mark — OK
haul out trash @ end (SO) try to replant trail in open areas
fence/gates have worked to keep transients out.
Corps has recently mowed new levee slope (within a month)
Justine Barton (EPA) took pic of sm round leaved marsh plant

→ I dry w/ Cascadia — Luis

Representative Photo Locations (Record Picture # and Time):

Year: 12 (2018), 17 (2023), 22 (2028)

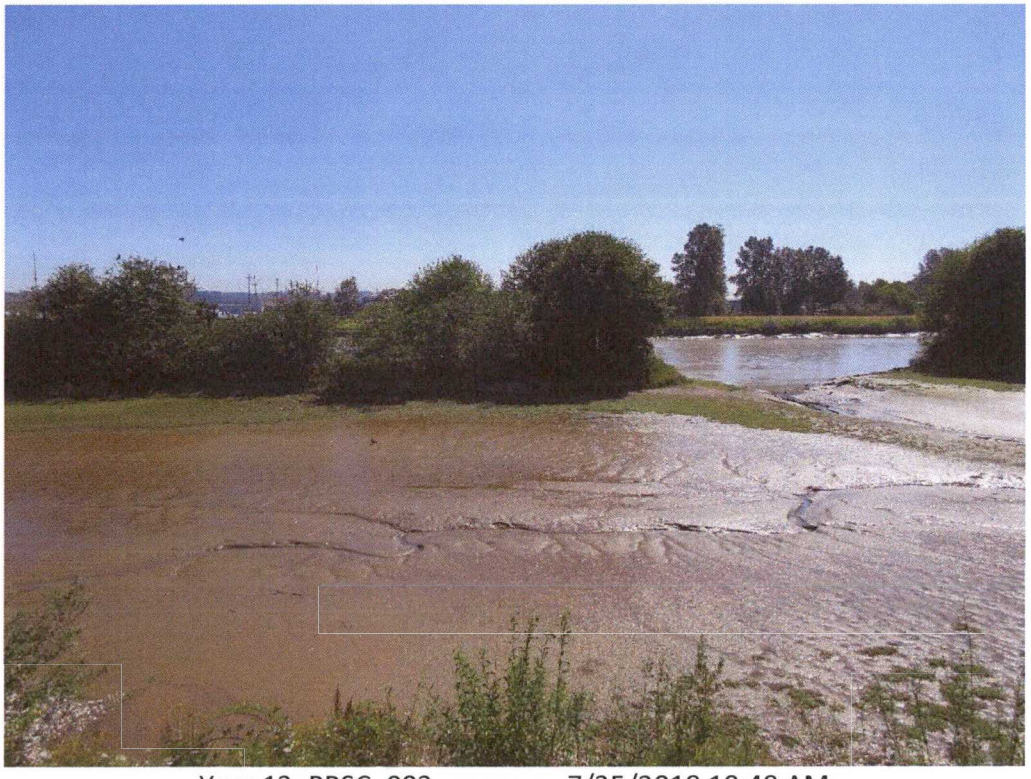
Site: PRSC

Date: 7.25.18

Location Description			Direction of Photo	Time	Approximate Tide
Puyallup Pre Side Channel		001, 002, 003	Pano (3) start @ N	10:48 am	-0.69
"	"	005, 006, 007	Pano (3) middle	10:52 am	-0.63
"	"	008	So end.	10:59 am	-0.93
"	"	009, 010, 011	mouth (3)	11:19 am	-0.15

Year 12 Puyallup River Side Channel (PRSC) Photographs

Year 12_PRSC_001 7/25/2018 10:48 AM



Year 12_PRSC_002 7/25/2018 10:48 AM

Year 12_PRSC_003 7/25/2018 10:48 AM

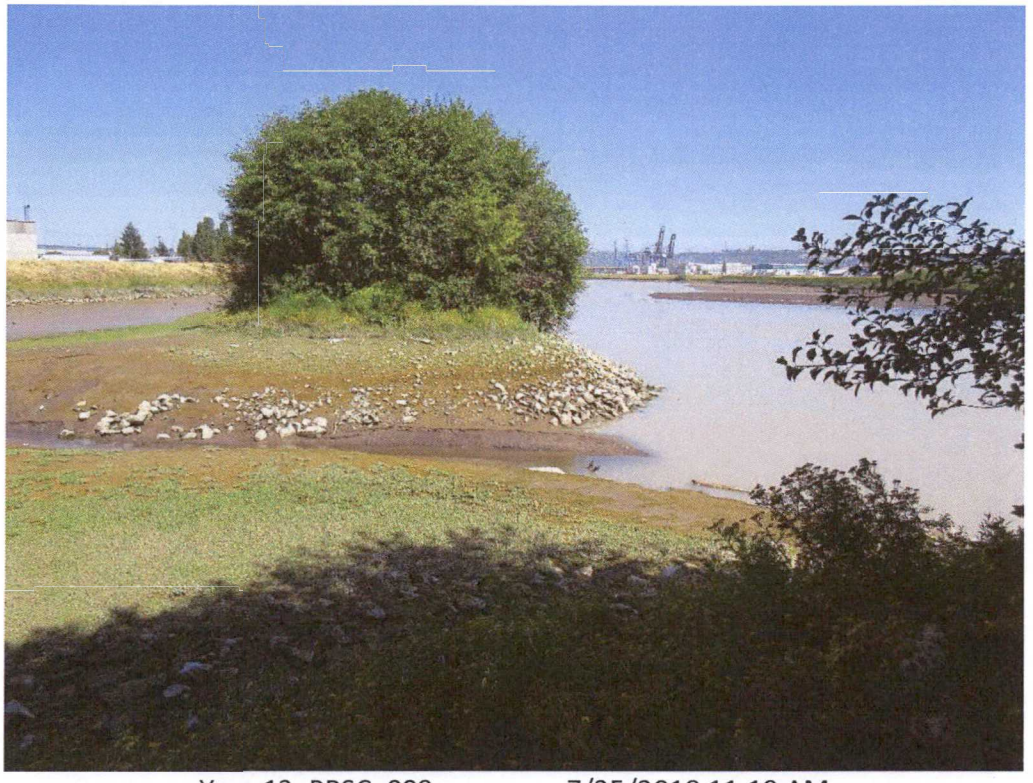
Year 12_PRSC_004 7/25/2018 10:48 AM

Year 12_PRSC_005 7/25/2018 10:52 AM

Year 12_PRSC_006 7/25/2018 10:52 AM

Year 12_PRSC_007 7/25/2018 10:52 AM

Year 12_PRSC_008 7/25/2018 10:59 AM



Year 12_PRSC_009 7/25/2018 11:19 AM

Year 12_PRSC_010 7/25/2018 11:19 AM

Year 12_PRSC_011 7/25/2018 11:19 AM

Hylebos Creek Mitigation Site

Qualitative Site Evaluation

Date: 7.26.18 Time: 12:45pm

Year: 12 (2018), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: D. Radice, M. Henley, J Cunnington, K. Koch

Weather Conditions: ~~Sunny~~, HOT

River Discharge* (CFS) (PRSC & HCH only): 2030 ft3/s 11.31 ft

Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion			none noted
Sedimentation		✓	no significant accumulation noted.
Wildlife Presence	✓		beaver, sm. avian spp.
Vegetation: Planted/Native			Good veg coverage/expansion of - american bugleweed. in large marsh area
Invasive			RC Grass, ~~Purple Loosestrife~~, BB, phragmites, pepperweed (wh. flwrs)
Animal Damage			beaver (not recent)
Disease (Vegetation)			none noted.
Human Impacts: Trash	✓		minor
Vandalism			none noted.
Large Woody Debris (Installed/Recruitment)			none noted.
Wrack or Organic Material			none noted.

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

sm. avian species

Any indication of fish obstruction in the channels? (HCH only) no

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only:

n/a

Notes:

No work on Bunker side! ☺

Representative Photo Locations (Record Picture # and Time):

Year: 12 (2018), 17 (2023), 22 (2028)

Site: Hylebos Creek
Date: 7.26.18

Location Description		Direction of Photo	Time	Approximate Tide
from bridge - looking downstream	039	N	12:52	1.28
from bridge - looking upstream	040	S	12:52	1.28
along creek main channel	041	S	1:05	1.75
" "	042	SW	1:05	1.75
" "	043	W	1:05	1.75
near large rock on east side upstream lobe	044	SW	1:18	2.3
" " "	045	W	1:18	2.3
" " "	046	NW	1:18	2.3
looking down downstream lobe	047	NW	1:29	2.82
looking up downstream lobe	048	SE	1:29	2.82
" " "	049	SE	1:29	2.82
" " "	050	SE	1:30	2.84
mouth of downstream channel	051	SW	1:34	3.08
" "	052	SW	1:34	3.08
" "	053	SW	1:34	3.08
" "	054	SW	1:34	3.08

Year 12 Hylebos Creek (HC) Photographs

Year 12_HC_039 7/26/2018 12:52 PM

Year 12_HC_040 7/26/2018 12:52 PM

Year 12_HC_041 7/26/2018 1:05 PM

Year 12_HC_042 7/26/2018 1:05 PM

Year 12_HC_043 7/26/2018 1:05 PM

Year 12_HC_044 7/26/2018 1:18 PM

Year 12_HC_045 7/26/2018 1:18 PM

Year 12_HC_046 7/26/2018 1:18 PM

Year 12_HC_047 7/26/2018 1:29 PM

Year 12_HC_048 7/26/2018 1:29 PM

Year 12_HC_049 7/26/2018 1:29 PM

Year 12_HC_050 7/26/2018 1:30 PM

Year 12_HC_051 7/26/2018 1:34 PM

Year 12_HC_052 7/26/2018 1:34 PM

Year 12_HC_053 7/26/2018 1:34 PM

Year 12_HC_054 7/26/2018 1:34 PM

Johnny's Dock Habitat Enhancement

Qualitative Site Evaluation

Date: 7.27.18 Time: 11:20 am Year: 12 (2018), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: D. Radice, M. Henley

Weather Conditions: Sunny, Hot.

River Discharge* (CFS) (PRSC & HCH only): ____

Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion	Y		minor in path area
Sedimentation			none noted.
Wildlife Presence			geese
Vegetation: Planted/Native			gumweed / salt grass / veg on logs
Invasive			thistle (minor)
Animal Damage	Y		geese "path"?
Disease (Vegetation)			none noted.
Human Impacts: Trash			none noted
Vandalism			none noted
Large Woody Debris (Installed/Recruitment)			present
Wrack or Organic Material			none noted.

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

geese, bees.

Any indication of fish obstruction in the channels? (HCH only) n/a

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only:

n/a

Notes:

bare spot (mid site) on slope b/t LWD - lots of geese tracks
"path" with square pavers up above?
Lots of gumweed — almost 100% coverage minus the "geese" area
~~pearly everlasting~~ cudweed. (small amt)

Representative Photo Locations (Record Picture # and Time):

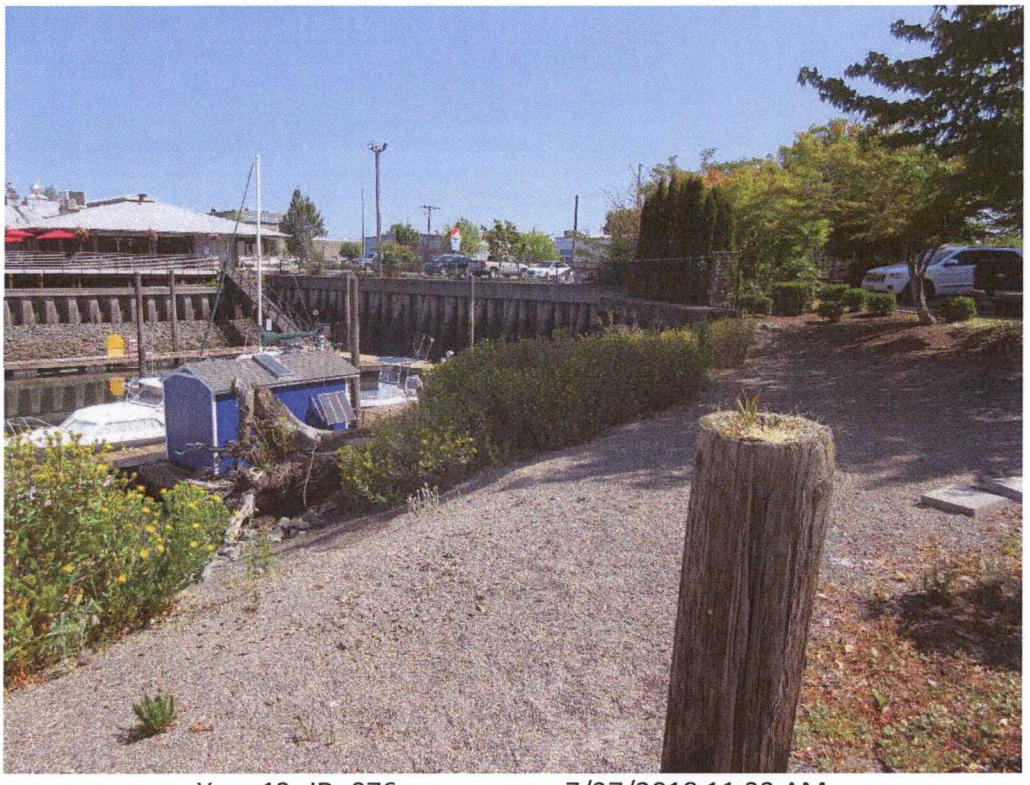
Year: 12 (2018), 17 (2023), 22 (2028)

Site: Johnny's Dock

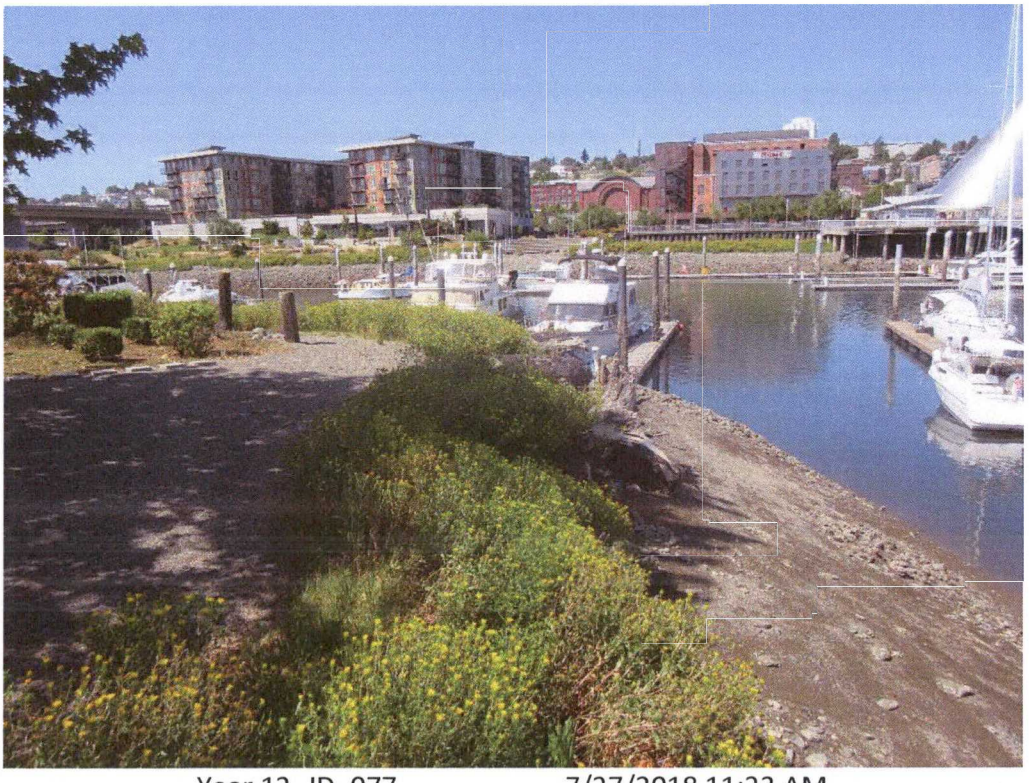
Date: 7.27.18

Location Description		Direction of Photo	Time	Approximate Tide
From shorter piling	076	NE	11:22	-1.02
From concrete bulkhead corner	077	SW	11:23.	-1.03
From beach on pt.	078	E	11:23	-1.03
" "	079	S	11:24	-1.04

Year 12 Johnny's Dock (JD) Habitat Photographs



Year 12_JD_076 7/27/2018 11:22 AM



Year 12_JD_077 7/27/2018 11:23 AM

Year 12_JD_078 7/27/2018 11:23 AM

Year 12_JD_079 7/27/2018 11:24 AM

Head of Thea Foss Shoreline Habitat

Qualitative Site Evaluation

Date: 7/27/18. Time: 10:57 am

Year: 12 (2018), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: D. Radice, M. Henley

Weather Conditions: sunny, hot

River Discharge* (CFS) (PRSC & HCH only): ———

Overall health and vigor of plants: (Excellent) Fair Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion			none noted
Sedimentation			none noted
Wildlife Presence	✓		bees. (gumweed) geese.
Vegetation: Planted/Native		✓	tufted hairgrass/carex @ top of veg
Invasive	✓		pepperweed/knapweed/wh.swt clvr/BB/ queen annes lace morning glory
Animal Damage			none noted
Disease (Vegetation)			none noted
Human Impacts: Trash			no significant noted.
Vandalism			none noted.
Large Woody Debris (Installed/Recruitment)		✓	installed present, no recruitment.
Wrack or Organic Material			none noted.

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence): bees, ladybug

Any indication of fish obstruction in the channels? (HCH only) n/a

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only: n/a.

Notes: more tufted hairgrass than previous years.
Potentilla is dominant veg @ No end / sumweed @ so. end.

Representative Photo Locations (Record Picture # and Time):

Year: 12 (2018), 17 (2023), 22 (2028)

Site: HTF - Head of Thea Foss

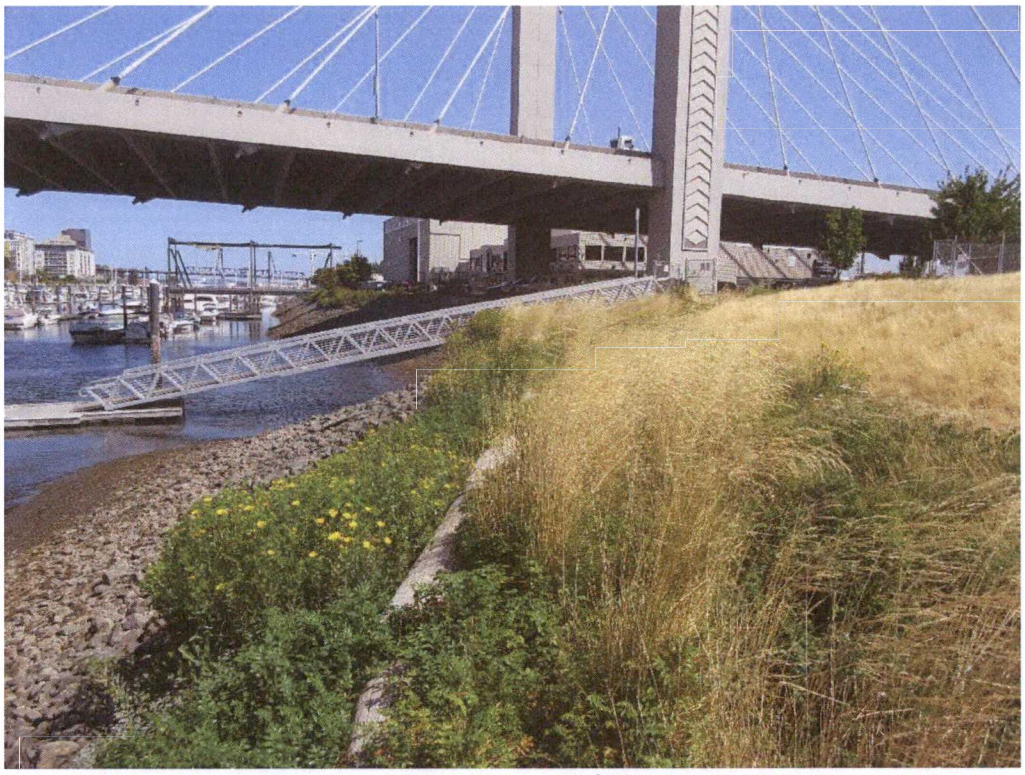
Date: 7.27.18

Location Description		Direction of Photo	Time	Approximate Tide
Kayak dock	070	E	10:59	-0.85
" "	071	SE	10:59	-0.85
Y4 ~~Mid~~ site (on log)	072	NE	11:05	-0.94
from entrance pt under 509)			~~11:05~~	
" "	073	S	11:05	-0.94
log out from Berg fence @ So end	074	N	11:09	-0.98
" "	075	E	11:09	-0.98

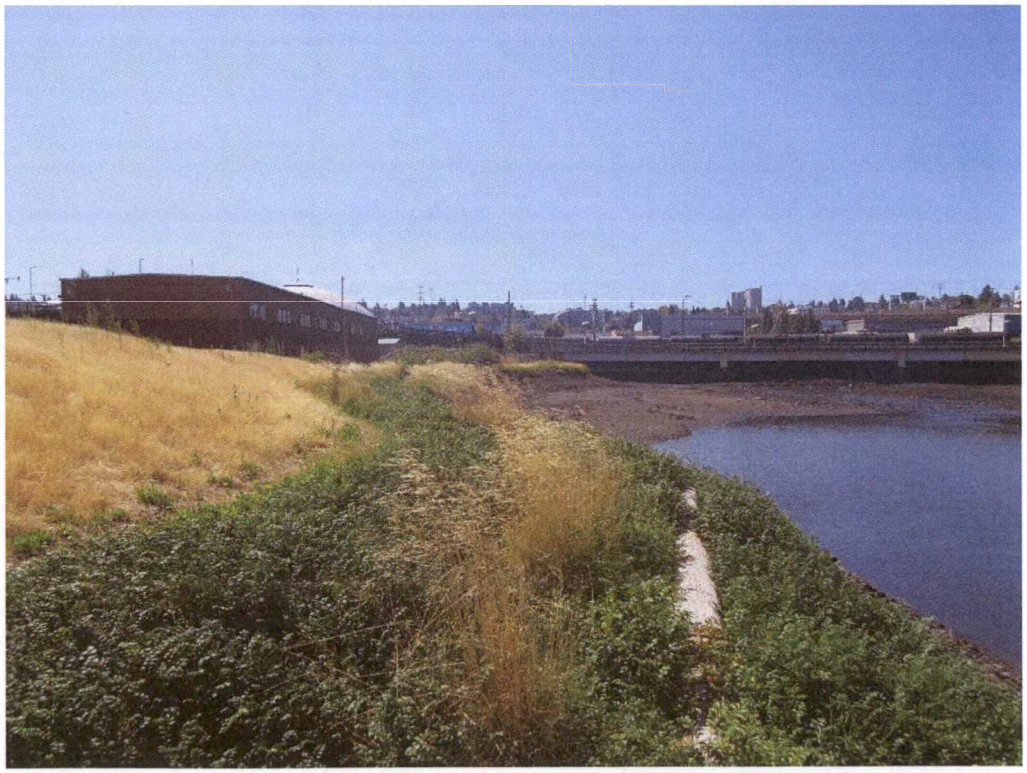
Year 12 Head of Thea Foss Shoreline (HTFS) Photographs

Year 12_HTFS_070 7/27/2018 10:59 AM

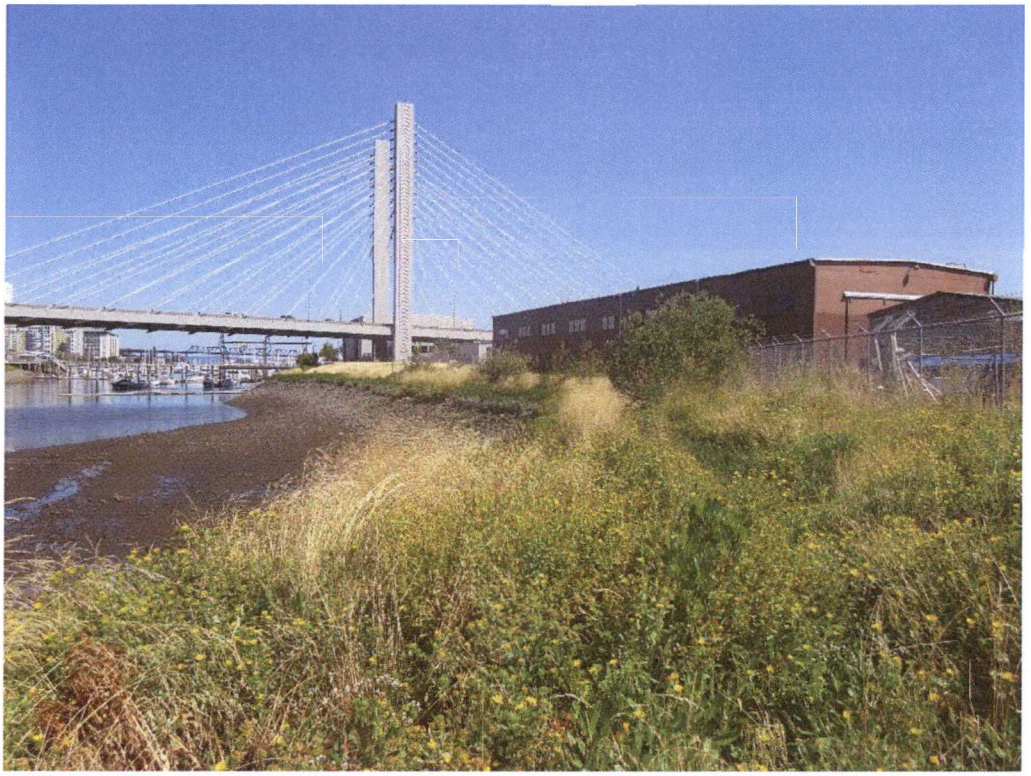
Year 12_HTFS_071 7/27/2018 10:59 AM



Year 12_HTFS_072 7/272018 11:05 AM



Year 12_HTFS_073 7/27/2018 11:05 AM



Year 12_HTFS_074 7/27/2018 11:09 AM

Year 12_HTFS_075 7/27/2018 11:09 AM

SR 509 Esplanade Riparian Habitat

Qualitative Site Evaluation

Date: 7.25.18 / 7/27/18 Time: 2:50pm Year: (12 (2018)), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), (SR509 Esplanade (509)), Log Step Habitat (LSH)

Staff Present: D. Radice, M. Henley

Weather Conditions: sunny, hot

River Discharge* (CFS) (PRSC & HCH only): n/a

Overall health and vigor of plants: Excellent (+ Fair) Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion	↓		slope under bridge had interesting "sloughing"
Sedimentation			none noted.
Wildlife Presence			bees,
Vegetation: Planted/Native			on "trail" gumweed! and @ no. end more diversity
Invasive			@ no. edge - pepperweed / thistle.
Animal Damage			none noted.
Disease (Vegetation)			none noted.
Human Impacts: Trash	↓		minimal.
Vandalism			~~none noted~~ 7/27 - broken shore pine.
Large Woody Debris (Installed/Recruitment)			none noted
Wrack or Organic Material			none noted

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

bees, pigeons, gull.

Any indication of fish obstruction in the channels? (HCH only) n/a

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only:

n/a

Notes:

trail still being maintained by ?? Gumweed actively being taken out.
WCC "mowing" grass areas per FWDA request in upland
So end more natives/vegetation in general vs no. end.
Transients noted – evidence of bathroom use/TP

North end has greater salt marsh diversity
– pickleweed/goose tongue/fleshy jaumea/salt grass.
lamb's quarters? ~~Orache~~/ brass buttons/ sand spurry/
tufted hairgrass.
– not fleshy
red stripes

No end – top of slope – very sparse w/plants
– may be due to condos/maintenance

Representative Photo Locations (Record Picture # and Time):

Year: 12 (2018), 17 (2023), 22 (2028)

Site: 509 Esplanade

Date: 7·27·18

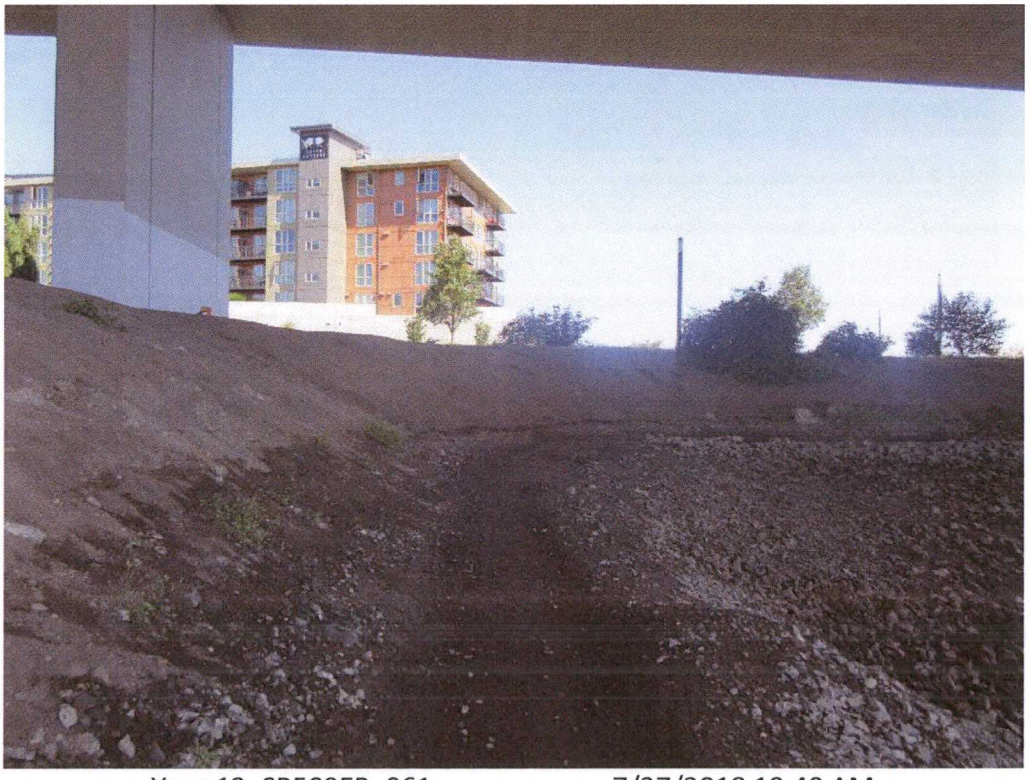
Location Description		Direction of Photo	Time	Approximate Tide
From grass/walkway of park · 3rd lightpole S of bridge (So End)	058	N	10:36	-0.47
From trail near eco block – south end	059	N	10:37	-0.50
Bridge abutment – From trail	060	S	10:40	-0.56
" "	061	N	10:40	-0.56
Trail corner under bridge	062	W	10:42	-0.60
" " "	063	N	10:42	-0.60
Trail end	064	S	10:43	-0.62
From walkway - 3rd pole north of bridge	065	S	10:49	-0.71
From corner of esplanade (No of bridge)	066	NE	10:51	-0.75
" " "	067	SW	10:51	-0.75
From kayak dock across waterway	068	W	10:59	-0.85
" "	069	NW	10:59	-0.85

Year 12 SR509 Esplanade Riparian (SR509ER) Photographs

Year 12_SR509ER_058 7/27/2018 10:36 AM

Year 12_SR509ER_059 7/27/2018 10:37 AM

Year 12_SR509ER_060 7/27/2018 10:40 AM



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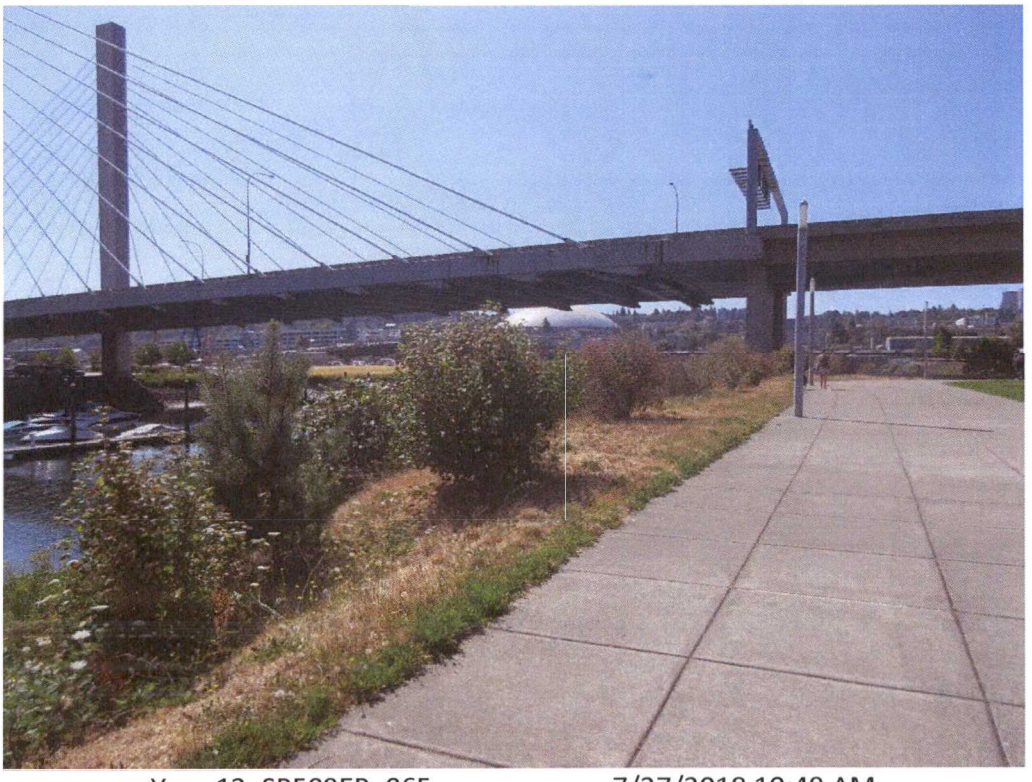
Year 12_SR509ER_062 7/27/2018 10:42 AM

Year 12_SR509ER_063 7/27/2018 10:42 AM

Year 12_SR509ER_064 7/27/2018 10:43 AM



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Year 12_SR509ER_066 7/27/2018 10:51 AM

Year 12_SR509ER_067 7/27/2018 10:51 AM

Year 12_SR509ER_068 7/27/2018 10:59 AM

Year 12_SR509ER_069 7/27/2018 10:59 AM

Log Step Habitat Enhancement

Qualitative Site Evaluation

Date: 7.25.18 / 7/27/18 Time: 2:25pm

Year: 12 (2018), 17 (2023), 22 (2028)

Site (circle): North Beach Habitat (NBH), Middle Waterway Tideflat (MWT), Puyallup River Side Channel (PRSC), Hylebos Creek Habitat (HCH) Johnny's Dock (JDH), Head of Thea Foss (HTF), SR509 Esplanade (509), Log Step Habitat (LSH)

Staff Present: D. Radice, M Henley

Weather Conditions: sunny, hot

River Discharge* (CFS) (PRSC & HCH only): n/a

Overall health and vigor of plants: Excellent Fair Poor

Qualitative Observations:

	Riparian Area**	Marsh Area	Comments
Erosion			no significant erosion noted,
Sedimentation			none noted
Wildlife Presence		✓	crabs, dark fish / fry shoreline
Vegetation: Planted/Native		✓	gumweed, pickleweed, fleshy jaumea, goose tongue,
Invasive	✓		blackberry @ top → spot spray (≈5 plants)
Animal Damage			none noted
Disease (Vegetation)			none noted
Human Impacts: Trash			none noted
Vandalism			none noted
Large Woody Debris (Installed/Recruitment)		✓	one lrg log tied up w/chain → infront of So. half
Wrack or Organic Material			none noted

* Data from USGS Puyallup River at Puyallup Station (USGS 12101500)

** For the Hylebos Creek site, use "Riparian" column for forested wetland and "Marsh" column for emergent wetland. Include additional qualitative notes on high slope upland vegetation below

Wildlife Notes (Species observed, other evidence):

seefront

Any indication of fish obstruction in the channels? (HCH only) ———

Visual presence/condition of habitat mix/fine-grained material at surface - NBH & PRSC only:

n/a

Notes:

needs blackberry spraying (5-10 plants)
South ½ of log step displaying much more diverse vegetation whereas before it was a dune grass monoculture
— could be due to the large log changing H_2O regime / flow / disturbance?

Representative Photo Locations (Record Picture # and Time):

Year: 12 (2018), 17 (2023), 22 (2028)

Site: Log Step Habitat

Date: 7.27.18

Location Description	Direction of Photo	Time	Approximate Tide
Vegetation on bench	N	10:25	-0.19
Looking back @ log step	NW	10:28	-0.29
From dock looking So	S	10:29	-0.30

Year 12 Log Step (LS) Habitat Photographs

Year 12_LS_055 7/27/2018 10:25 AM

Year 12_LS_056 7/27/2018 10:28 AM

Year 12_LS_057 7/27/2018 10:29 AM

Attachment B

Slope Rehabilitation Monitoring Field Notes and Photographs

Wheeler-Osgood Waterway
(Remedial Areas 11, 13, and 10)

6/28/18 Pg 1 of 6

Slope rehabilitation inspections for Year 12
in RAs 11, 13, and 10

Weather: mid 60's, overcast

Leave ~~CWN~~ at 10 am

GPS Benchmark check: completed at DEA 2018 @ 10:10 am
within +/- 5 ft for both GPS units

Erin Cosnowski } Floyd Snider
Amanda McKay }

Steve Shartencarrier }
Sarah Narberg }
Mary Henley } City of Tacoma
Desirae Radice }

Kristine Koch } EPA
Justine Barton }

Start inspection at west end of RA-11 @ 10:35 am:

Starting Point N 705289 > WA State Plane South
E 1161207

Upper slope is riprap, lower slope primarily silt + sand with some scattered rip rap. All along upper slope are pilings sticking up through rip rap.

Private outfall on upper bank - no flow.

↘ N 705265
E 1161295

Near outfall some groundwater seepage (~20 ft stretch to east of outfall)

Welding EC ~~Creosote~~ odor noted

N 705238
E 1161414

N 705226
E 1161459

Change in slope composition ↗ Sand and silt with some scattered rip rap or quarry spalls. Concrete overhangs above slope area, still piles present on upper slope.

EC

6/28/18

Y12 Slope Rehabilitation Inspection Notes (continued)

RA 11 inspection continued.

outfall @ N 705221
E 1161497 - no flow

more gravel, shells on surface just east of outfall

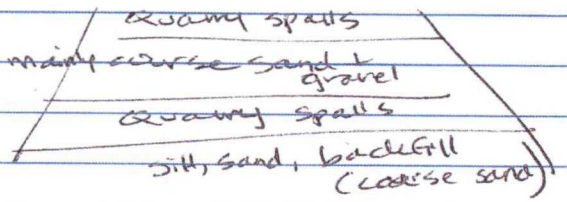
outfall @ N 705186
E 1161622 - no flow

channel backfill ~~material noted beneath~~ silt on bottom of slope in this area (coarse sand)

This outfall marks the end point of RA 11 and start point of RA 13.

RA 13 inspection notes — start at 10:55 am.

Quarry spalls on uppermost portion of slope transitioning to coarse sand + gravel with some quarry spalls interspersed. transitioning to area 5-10 ft wide of primarily quarry spalls, transitioning to silt, sand, and backfill material at the base of the slope.



Transition is slope composition — rip rap with sand in between on upper slope. On very upper portion of slope some pilings sticking up through rip rap. Lower portion of slope - mix of coarse sand, gravel, some silt, shell debris.

Transition in material near head of waterway:

@ N 705176
E 1161982

EC

6/28/18
412 Slope Rehabilitation Inspection Notes (continued)

Outfall at this location – no flow, on south side of waterway. Some groundwater seepage noted below on the slope where the outfall is present. More riprap in this area. Slope then changes eastward to primarily sand + gravel up to the mouth of outfall #254.

11:15am N 705176
E 1161981 > at mouth of outfall #254 – flowing into waterway
time in waterway about 20 feet off of the mouth of the outfall.
Slope to the north of the outfall mouth is primarily larger quarry spalls on upper portion of slope. and silt, sand, and gravel on the lower portion of the slope.

N 705280 – upper portion of slope is concrete, transitioning
E 1162042 to silt, sand, and gravel primarily on lower half of slope (~ 20 foot wide area).
After 20 ft – transitions to slope primarily covered with quarry spalls, some silt, sand, and gravel present at very base of slope and mixed in with quarry spalls.

Groundwater seep present at N 705272
E 1161997

Quarry spall slope ends, transitions to slope with cobbles, sand, and gravel to the west. N 705277 E 1161972

Starting inspection of the sheen source removal cap area @ 11:48. inspection notes included on ~~Other~~ field forms for slope cap area.

Resuming slope rehab inspections at RA 13 @ 12:15 pm.
Just west of sheen source removal area, see

EC

6/28/18

412 Slope Rehabilitation Inspection Notes (continued)

isolated spots of blueish, milky colored sheen on water's surface where base of slope ends.
~ 10' x 15' area of sheen noted adjacent to and west of sheen sauce removal area. Isolated smaller ~~Another~~ sheen spots noted along RA 13 between

start N 705296 E 1161847 and end 705316 1161675 (Endpoint of RA 13)

In this area primarily quarry spalls on upper slope (~ 5–7 ft wide), lower slope is gravel, sand primarily, some quarry spalls.

outfall @ N 705337
-no flow E 1161732

Slightly larger sheen area below base of slope approx 20 ft x 20 ft
@ N 705316
E 1161745
(located within start/end of sheen area noted above)

1225pm N 705316 E 1161675 > Endpoint of RA13, Start point of RA10

outfall at starting point, no flow.
Begin inspection of RA 10 slope rehabilitation area
Slope primarily covered with gravel and sand, scattered quarry spalls.

Groundwater discharge noted at N 705341
E 1161675

Slope transitions to more silty sand covered slope, some isolated cobbles. N 705341 E 1161611

N 705417
E 1161484 > pilings on top portion of slope in sandy material. observed for long stretch westward appear to end near Manne Floats Dock (east end)

EC

6/28/18

4/12 Slope Rehabilitation Inspection Notes (continued)

RA 10 inspection continued:

N 705438 > outfall pipe, no flow.
E 1161415

Start N 705448 > ~~some coordinates, but location is off~~ GPS bouncing around. Area of ~~sheen~~ scattered sheen spots observed on water surface on lower portion of slope (below knee/ in slope) (and in a ~~one~~ isolated ~~spot~~ spots on upper portion of slope (in one area)) noted on water surface as well (~~in this area~~), throughout this area

End N 705444 > end of observed ~~sheen~~ sheen spots on lower portion of slope
E 1161346

N 705589 > Lots more debris on shoreline in this area heading west, also this is approx. the starting point of the ~~Marine~~ floats dock - ~~eastern~~ most extent. Debris consists of large concrete blocks primarily, piling in upper portion of slope. Also some metal debris.

Upper portion of slope primarily grassy spalls, rip rap, concrete block. Lower slope is silt + sand + gravel mixed. also some groundwater seeps present in this area.

N 705529 > more sheen spots observed on water surface on lower portion of slope. (approx 20 ft stretch to the west).

Note: sheen on water surface tends to appear in areas of the shoreline that are more wet (both in RA13 and RA10).

N 705529 > end of area where more debris observed on upper portion of slope.
E 1161059

Slope transitions to sandier slope with some gravel.

EC

6/28/18

412 Slope Rehabilitation Inspection Notes (continued)

RA 10 inspection continued:

N 7055606 E 1160964 > start of wooden bulkhead wall, lower slope is cobbles, gravel, sand, and large shell debris mixing westward and large worm casings present as well.

N 7055990 E 1160856 > end of wooden bulkhead wall, slope westward primarily large gravel, cobble, transitioning to more sand on lower portion of slope. also see some sheen spots on water surface on lower portion of slope (more sandy) starting at this location. (~25 ft stretch) of scattered sheen observed spots

N 7056047 E 1160748 > Endpoint of RA 10 @ 13:02 Inspections ended.

EC

SLOPE REHABILITATION VISUAL INSPECTION

Thea Foss and Wheeler Osgood Waterways LTMP

PHOTO DOCUMENTATION

Date: 6/28/18

Weather: Overcast

Remedial Area: RA-11

Field Personnel: Steve Shorten carrier, Sarah Norberg

Photograph Number	Latitude/Longitude (Northing/Easting)	Direction of Photo	Time	Tide Level (MLLW) actual	Notes
102-0438	705292, 1161201	E	1037	-0.5	~10' from start of interval
439	705280, 1161249	E	1038	-0.5	~30' into interval
440	705264, 1161318	E	1040	-0.7	~100' into interval - north of fence/piling
441	705246, 1161388	E	1041	-0.7	~150' " " - north of large tree
442	705231, 1161466	E	1043	-0.7	~200' " " ~25' west of outfall pipe
443	705218, 1161526	E	1045	-0.8	~250' " " ~25' east of outfall pipe
444	705232, 1161575	SE	1047	-0.8	End of interval - north of fallen tree
	[illegible]	[illegible]			
	[illegible]	E			

Additional Notes:

SLOPE REHABILITATION VISUAL INSPECTION

Thea Foss and Wheeler Osgood Waterways LTMP

PHOTO DOCUMENTATION

Date: 6/28/18

Weather: Overcast

Remedial Area: RA-13

Field Personnel: Steve Shortencarrier, Sarah Norberg

Photograph Number	Latitude/Longitude (Northing/Easting)	Direction of Photo	Time	Tide Level (MLLW) (Actual)	Notes
102-0445	705225, 1161624	SE	1048	-0.8	Beginning of interval - north of small outfall pipe.
446	705189, 1161675	E	1050	-0.8	50' into interval - north of butterfly bush
447	705176, 1161731	E	1059	-1.1	~100' " "
448	705164, 1161815	E	1101	-1.1	~200' " " - north of piling & concrete curb
449	705172, 1161873	E	1103	-1.1	~250' " " - north of piling
450	705189, 1161978	SE	1107	-1.2	~300' " " - @ fallen tree
451	705194, 1162025	SE	1108	-1.2	~350' " " - under large tree
452	705184, 1162075	NE	1109	-1.2	25' SW of outfall pipe.
453	705225, 1162080	NW	1116	-1.3	20' NW of outfall pipe.
454	705261, 1162036	W	1117	-1.4	South of asphalt pile
455	705270, 1161981	W	1120	-1.4	50' west of asphalt pile. End of interval
(1) 102-0459 (reversed order)	705283, 1161938	W	1154	-1.5	Beginning of sheen source area looking west
458	705286, 1161909	S	1154	-1.5	Sheen
(1) 460	705294, 1161863	S	1158	-1.5	Sheen around algae
464	705296, 1161868	W	1215	-1.4	End of sheen source area looking west
465	705309, 1161790	W	1217	-1.4	~100' from end of interval
466	705320, 1161742	NW	1217	-1.4	Last 50' of interval - 25' SE of outfall pipe.
467	705318, 1161739	SE	1222	-1.3	Sheen area - 25' SE of outfall pipe

Additional Notes:

(1) Break in photo sequence - due to slope cap inspection being performed in sheen source removal area within RA13 (other photos reported on slope cap monitoring photo documentation form: 102-0457, 102-0461 to 102-0463).

No photo # 6220456 - deleted in field. (EC)

SLOPE REHABILITATION VISUAL INSPECTION

Thea Foss and Wheeler Osgood Waterways LTMP

PHOTO DOCUMENTATION

Date: 6/28/18

Weather: Overcast

Remedial Area: RA-10

Field Personnel: Steve Shortencarrier, Sarah Norberg

Photograph Number	Latitude/Longitude (Northing/Easting)	Direction of Photo	Time	Tide Level (MLLW) Actual	Notes
102-0468	705338, 1161669	W	1224	-1.3	Beginning of interval looking west.
469	705361, 1161622	NW	1225	-1.3	South of rusty pipe looking NW
470	705389, 1161566	NW	1227	-1.3	" " 2nd " " " NW
471	" "	W	1227	-1.3	" " " " " W
472	705404, 1161503	W	1228	-1.2	South of end of concrete wall.
473	705433, 1161430	W	1230	-1.2	15' SE of outfall pipe.
474	705457, 1161341	W	1231	-1.2	South of large tree.
475	705471, 1161285	W	1234	-1.1	South of start of concrete on pilings.
476	705506, 1161237	W	1236	-1.1	20' east of concrete block.
477	705513, 1161206	W	1237	-1.1	From top of concrete block.
478	705520, 1161163	W	1239	-1.1	5' east of outfall pipe.
479	705543, 1161089	W	1241	-1.0	From old log. ~350' from end of interval
480	705566, 1161005	W	1242	-1.0	25' east of ramp.
481	705567, 1160964	W	1243	-1.0	Under ramp.
482	705593, 1160869	W	1255	-0.7	15' SE from end of wood wall
483	705609, 1160793	W	1257	-0.7	25' SE of large tree.
484	705649, 1160740	SE	1300	-0.5	End of interval looking back.

Additional Notes:

Year 12 Remedial Area 11 Photographs

Year 12_RA-11_P1020438 6/28/2018 10:37 AM

Year 12_RA-11_P1020439 6/28/2018 10:38 AM

Year 12_RA-11_P1020440 6/28/2018 10:40 AM

Year 12_RA-11_P1020441 6/28/2018 10:41 AM

Year 12_RA-11_P1020442 6/28/2018 10:43 AM

Year 12_RA-11_P1020443 6/28/2018 10:45 AM

Year 12_RA-11_P1020444 6/28/2018 10:47 AM

Year 12 Remedial Area 13 Photographs

Year 12_RA-13_P1020445 6/28/2018 10:48 AM

Year 12_RA-13_P1020446 6/28/2018 10:50 AM

Year 12_RA-13_P1020447 6/28/2018 10:59 AM

Year 12_RA-13_P1020448 6/28/2018 11:01 AM

Year 12_RA-13_P1020449 6/28/2018 11:03 AM

Year 12_RA-13_P1020450 6/28/2018 11:07 AM

Year 12_RA-13_P1020451 6/28/2018 11:08 AM

Year 12_RA-13_P1020452 6/28/2018 11:09 AM

Year 12_RA-13_P1020453 6/28/2018 11:16 AM

Year 12_RA-13_P1020454 6/28/2018 11:17 AM

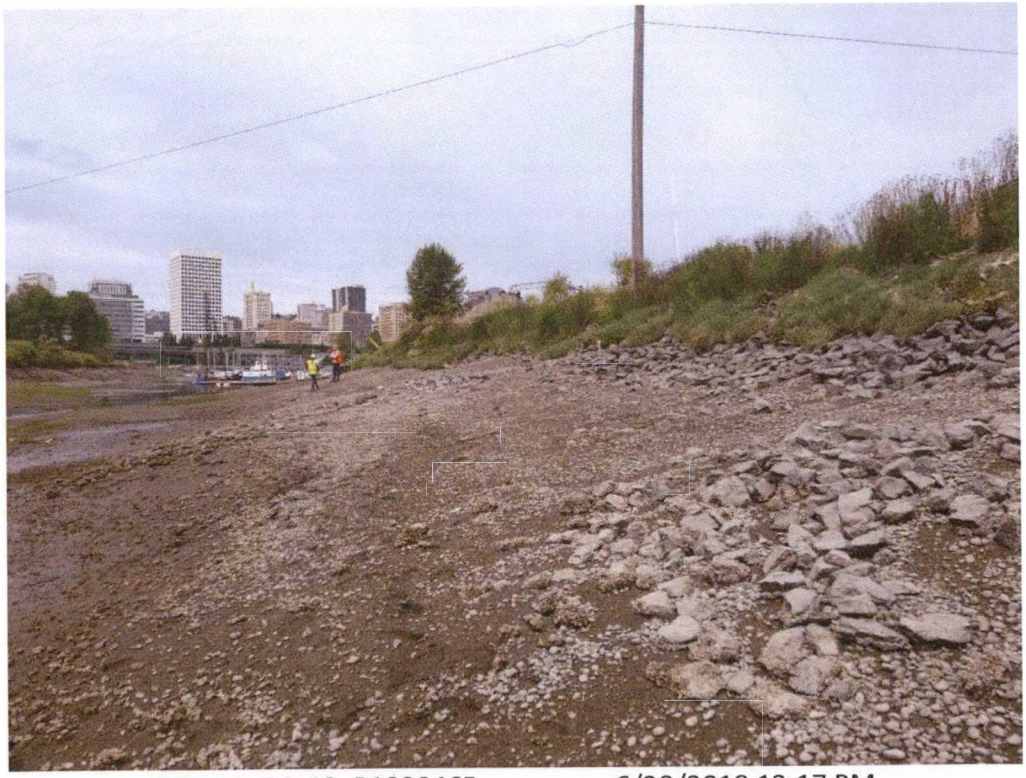
Year 12_RA-13_P1020455 6/28/2018 11:20 AM

Year 12_RA-13_P1020458 6/28/2018 11:54 AM

Year 12_RA-13_P1020459 6/28/2018 11:54 AM

Year 12_RA-13_P1020460 6/28/2018 11:58 AM

Year 12_RA-13_P1020464 6/28/2018 12:15 PM



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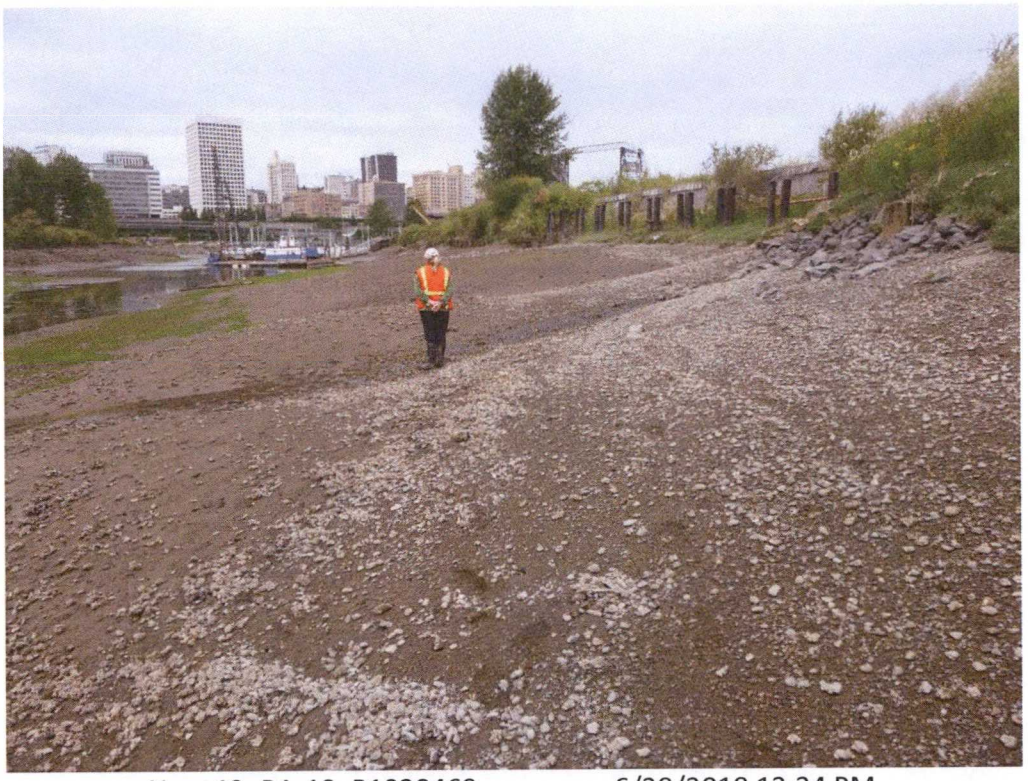
Year 12_RA-13_P1020466 6/28/2018 12:17 PM

Year 12_RA-13_P1020467 6/28/2018 12:22 PM

Year 12 Remedial Area 10 Photographs



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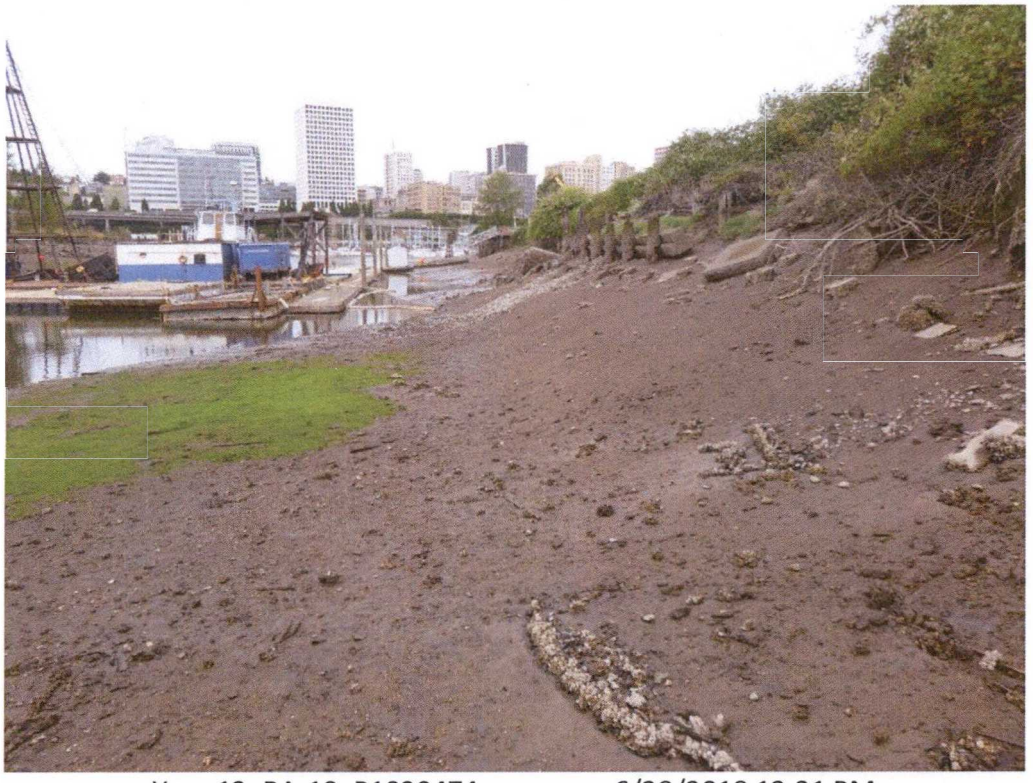
Year 12_RA-10_P1020469 6/28/2018 12:25 PM

Year 12_RA-10_P1020470 6/28/2018 12:27 PM

Year 12_RA-10_P1020471 6/28/2018 12:27 PM

Year 12_RA-10_P1020472 6/28/2018 12:28 PM

Year 12_RA-10_P1020473 6/28/2018 12:30 PM



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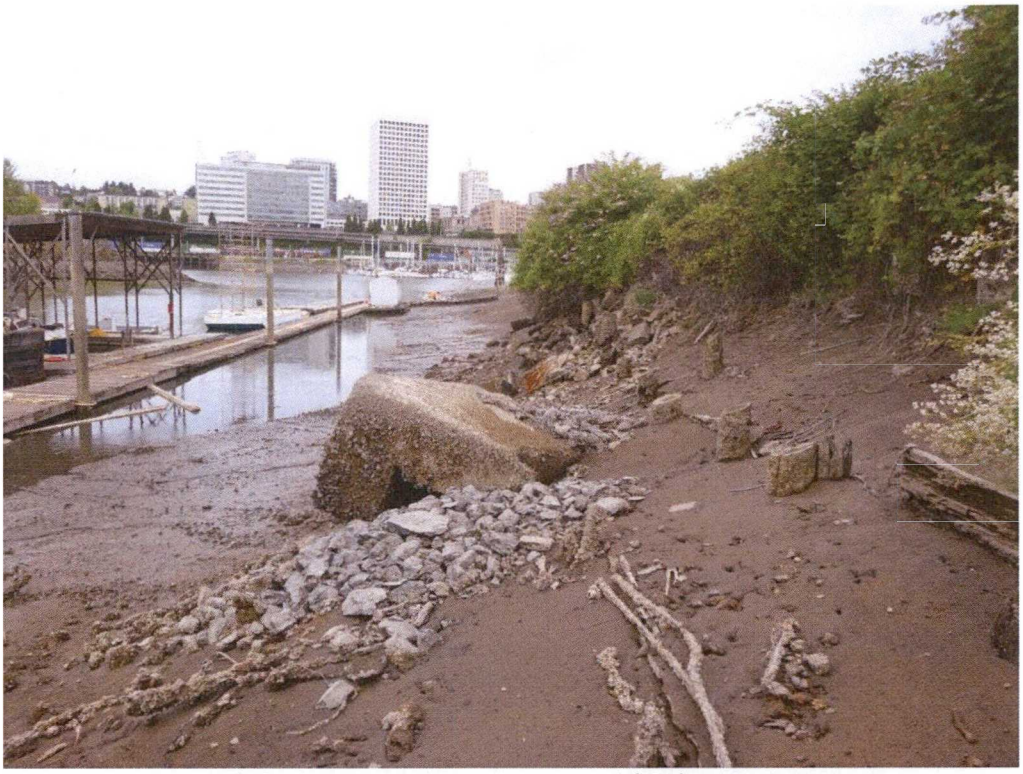
Year 12_RA-10_P1020475 6/28/2018 12:34 PM



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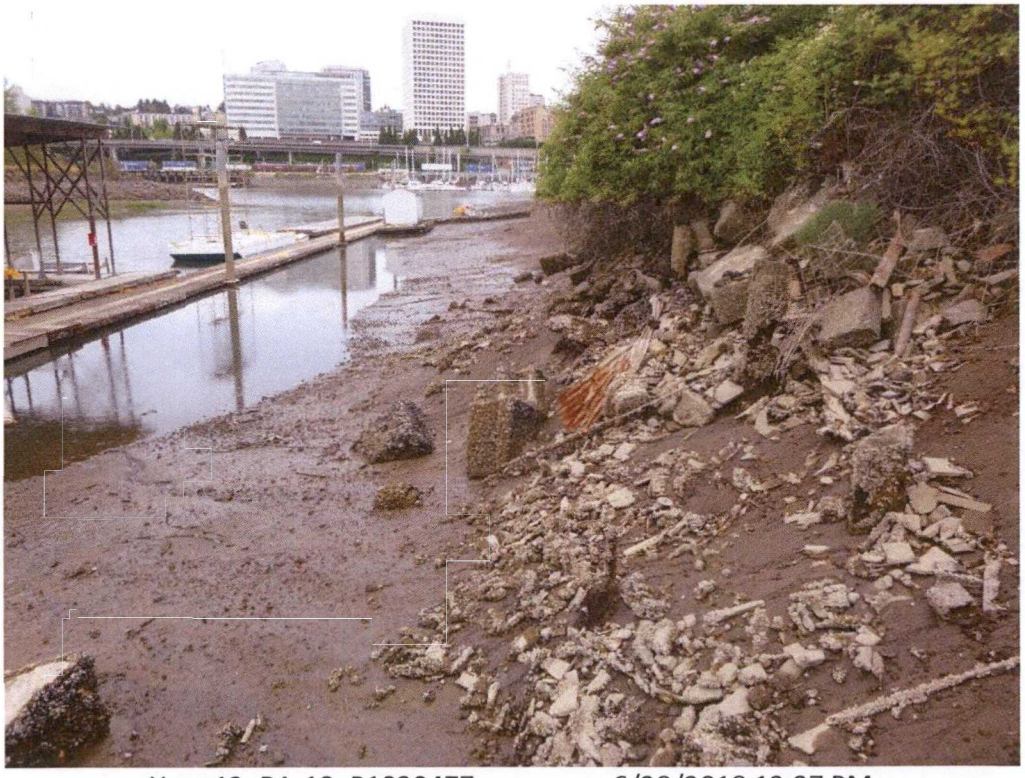

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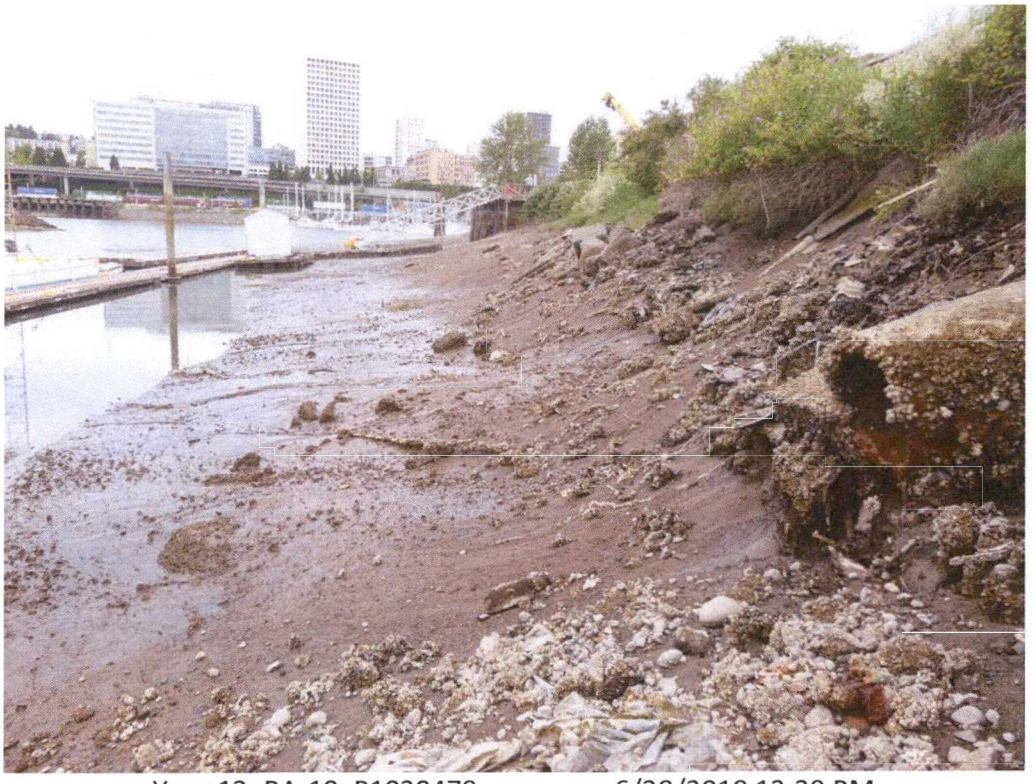

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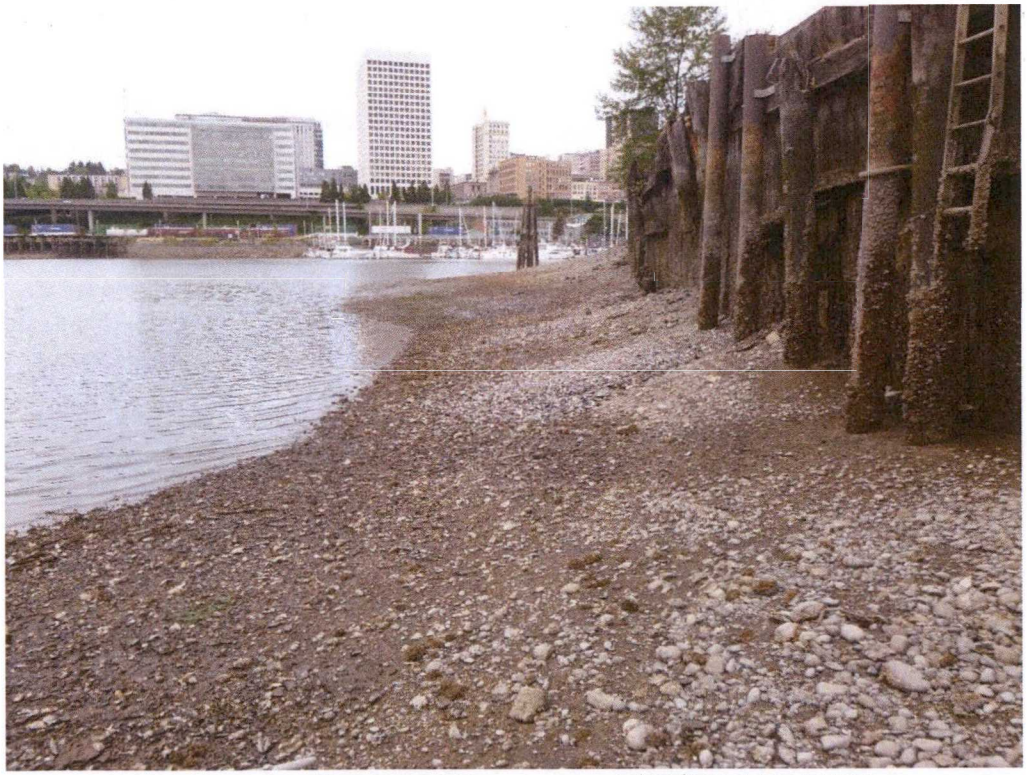
Year 12_RA-10_P1020479 6/28/2018 12:41 PM

Year 12_RA-10_P1020480 6/28/2018 12:42 PM



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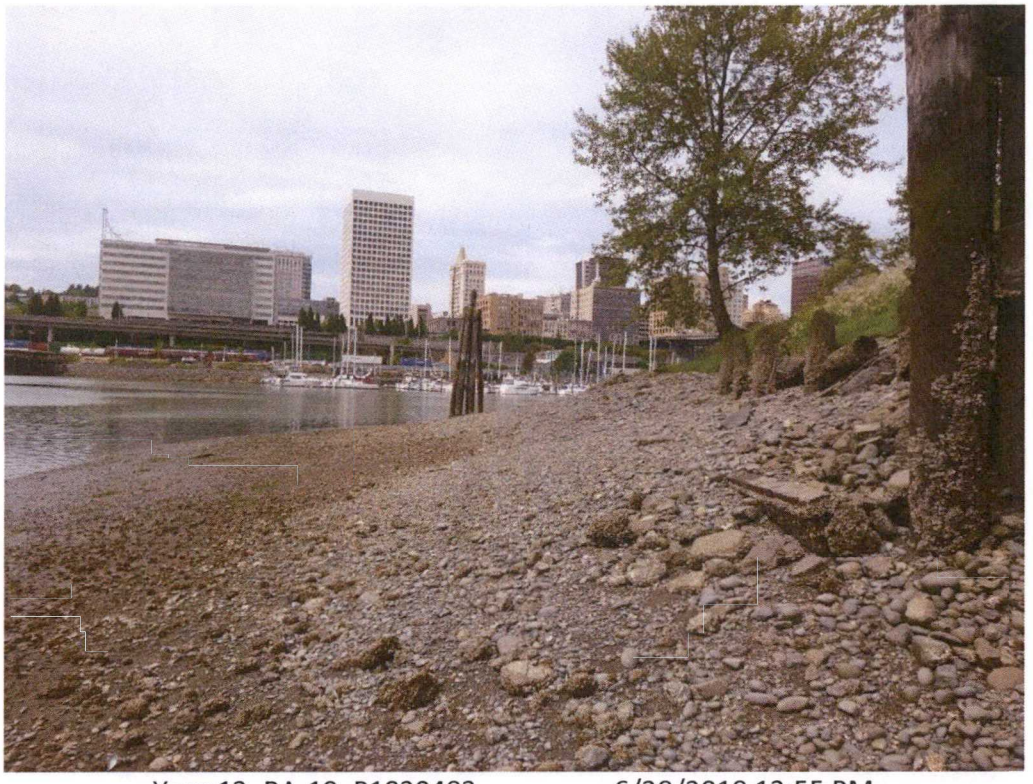

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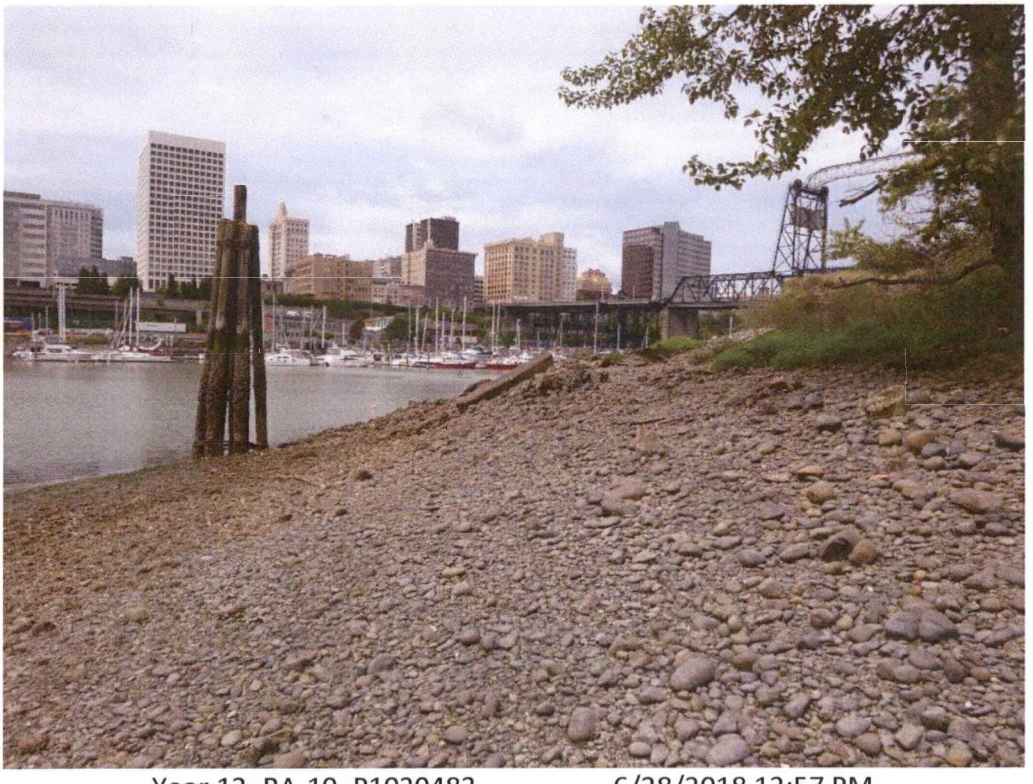

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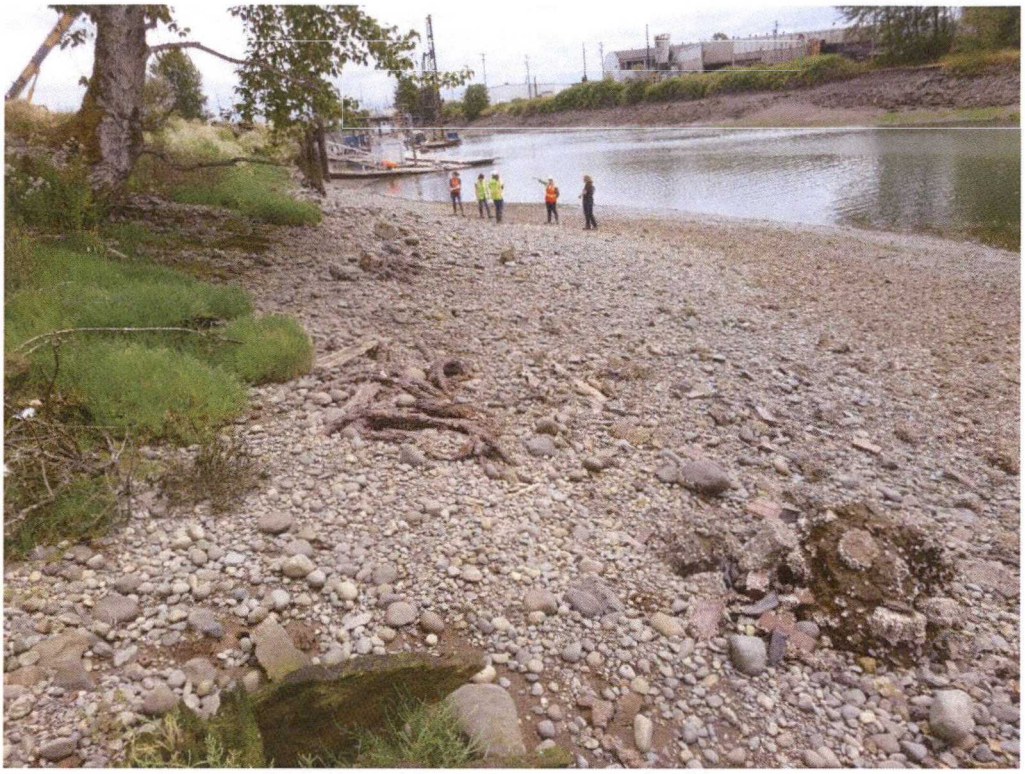


Year 12_RA-10_P1020484 6/28/2018 1:00 PM

Remedial Area 15

6/27/18

Slope rehabilitation inspection in RA 15 – Year 12

Weather: ~65°, overcast

GPS Benchmark check: Completed at DEA 2018, both units within 1/5 5 feet.

Erin Cesnauski, Amanda McKay } Floyd Snider

Sarah Norberg, Matt Brown, Steve Shertenlieb, Mary Henley, Desirae Radice } City

Rachel Sangsland, Haley Abbruscato } WCC

Kristie Koch, Justine Barton } EPA

Start RA 15 inspection at 11:27 am, adjacent to sheetpile wall to the south

N
E > GPS bouncing around, no coordinates available.

Surface of slope is mix of riprap and quarry spalls covered with layer of habitat mix.

Some water seeping through holes or seams in sheet pile wall to south of slope rehab area,

Sediment accretion along the waterline. Several inches thick in places,

Rocks covered with barnacles + mussels.

City outfall 248 – coordinates N: 703671 E: 1160884

Flow from outfall, no disturbance of slope beneath mouth of outfall.

City outfall 249 – coordinates N: 703902 E: 1160858

Flow from outfall, no disturbance of slope beneath mouth of outfall.

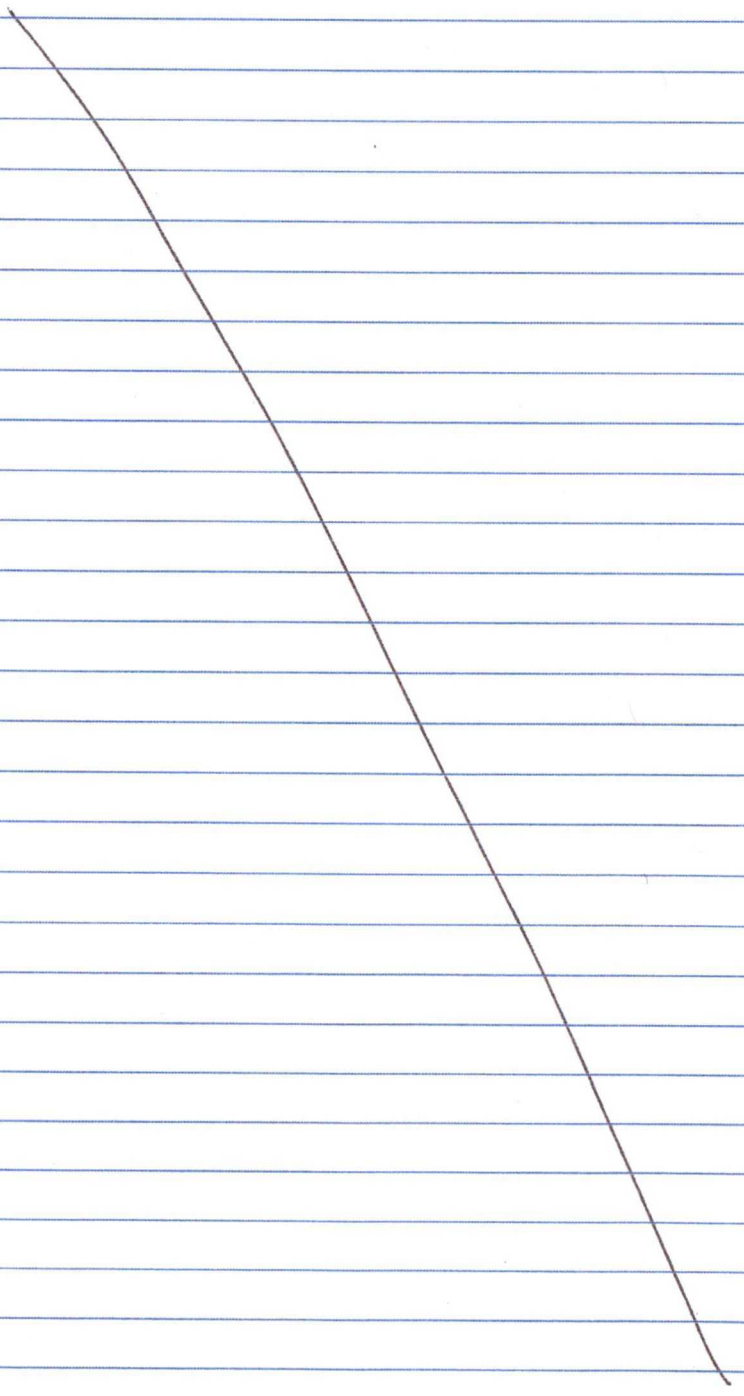
EC

Year 12

6/27/18 – RA 15 slope rehab inspection (continued)

Under gangway at north end of RA-15, ~~there~~ are chunks of asphalt mixed in with rip rap, quarry spalls, and habitat mix near the upper portion of the slope.

End of RA-15 inspection at 11:58.



SLOPE REHABILITATION VISUAL INSPECTION

Thea Foss and Wheeler Osgood Waterways LTMP

PHOTO DOCUMENTATION

Date: 6/27/18

Weather: Overcast

Remedial Area: RA-15

Field Personnel: Steve Shortenawrler, Sarah Norberg

Photograph Number	Latitude/Longitude (Northing/Easting)	Direction of Photo	Time	Actual Tide Level (MLLW)	Notes
102-0427	703621, 1160874	S	1132	-1.5	First 50' of interval @ 50'
428	" "	N	1133	-1.5	Second 50' of interval @ 50'
429	703659, 1160885	N	1136	-1.4	Third 50' of interval @ -10' from outfall pipe.
430	" "	S	1137	-1.4	Beginning of interval @ " " " "
431	703722, 1160878	N	1139	-1.4	4th interval @ +50' from outfall pipe. (west of tree)
432	703743, 1160880	N	1141	-1.3	5th " @ +100' " " " (west of tree)
433	703808, 1160882	N	1142	-1.3	6th " @ +150' " " " (west of tree)
434	703869, 1160880	N	1145	-1.3	7th " @ +200' " " " (west of tree)
435	703905, 1160869	NW	1146	-1.2	8th " @ -5' from 2nd outfall pipe
436	703931, 1160839	NW	1150	-1.2	End of interval from under ramp.
437	703971, 1160819	S	1156	-1.2	End of interval looking back @ +10'

Additional Notes:

Year 12 Remedial Area 15 Photographs

Year 12_RA-15_P1020427 6/27/2018 11:32 AM

Year 12_RA-15_P1020428 6/27/2018 11:33 AM

Year 12_RA-15_P1020429 6/27/2018 11:36 AM

Year 12_RA-15_P1020430 6/27/2018 11:37 AM

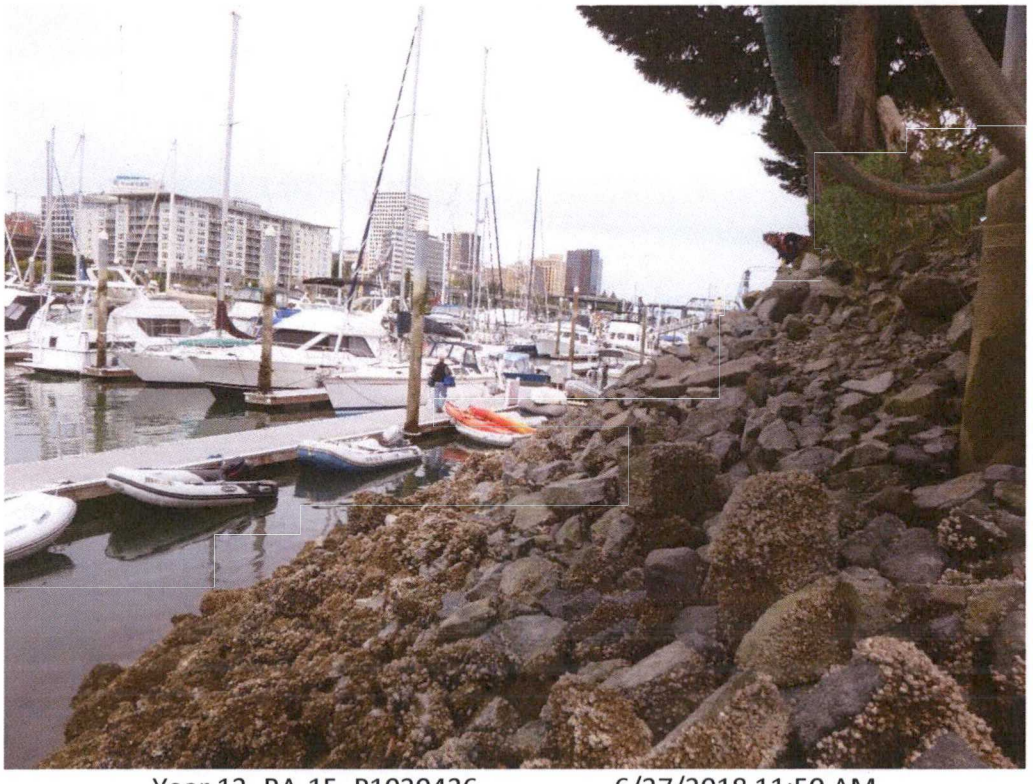
Year 12_RA-15_P1020431 6/27/2018 11:39 AM

Year 12_RA-15_P1020432 6/27/2018 11:41 AM

Year 12_RA-15_P1020433 6/27/2018 11:42 AM

Year 12_RA-15_P1020434 6/27/2018 11:45 AM

Year 12_RA-15_P1020435 6/27/2018 11:46 AM



Year 12_RA-15_P1020436 6/27/2018 11:50 AM

Year 12_RA-15_P1020437 6/27/2018 11:56 AM